

A TREATISE ON GENERAL MEDICAL THERAPEUTICS

OF PHARMACY, DISPENSING
AND ADMINISTRATION
OF DRUGS

BY
DAS GHOSH
CALCUTTA
SCHOOL OF MEDICAL, CALCUTTA
COLLEGE SCHOOL

EDITED BY
DEARE
IN THE MEDICAL SERVICE,
AND THERAPEUTICS, MEDICAL
OFFICER IN CHARGE TO THE COLLEGE HOSPITAL
CALCUTTA UNIVERSITY OF CALCUTTA

FIFTH EDITION

CALCUTTA: HILTON AND CO

1913

revised

Price Rs. 5, or 7s 6d net

MATERIA MEDICA

PART I

Materia Medica, in its widest sense, means the description of *materials* or *agents* employed in the treatment of disease. But properly speaking, it includes the following branches:—

1. **Materia Medica Proper** is the science which treats of natural history, as well as the physical and chemical characters, of drugs.

2. **Pharmacy** is the science and art of preparing and combining drugs, so as to make them fit for administration. It can be divided into two parts, as follows:—

(a) **Extemporaneous Pharmacy** is the making up or the compounding of formulæ or prescriptions of medical practitioners. **Dispensing** refers to the mode of putting up, labelling, and despatching.

(b) **Official Pharmacy** consists in the preparation of drugs and formulæ according to such processes as are recognised by, or prescribed in, an official pharmacopœia. The British Pharmacopœia is the official pharmacopœia of the British Empire.

3. **Pharmacology** is the science which describes the actions of medicines on the general system, or on the individual parts of the body, in health and disease. **Pharmacodynamics** is but another name for Pharmacology though, strictly speaking, it refers to the actions of drugs in health only.

Toxicology or the toxic action of medicines comes under Pharmacology. It treats of the actions of drugs when given in doses large enough to endanger life.

4. **Therapeutics** relates to the remedial measures employed in the treatment of disease. It may be either **empirical** or **rational**.

(a) **Empirical Therapeutics** means the treatment of disease from experience only, and conforms to no pharmacological law yet known. In empirical treatment no explanation can be given for the success or otherwise of the use of a *particular drug* for a *particular disease*. We merely prescribe a certain drug because it has been found successful in a certain disease. A familiar example is the use of mercury in syphilis.

(b) **Rational Therapeutics.**—By rational treatment we mean a mode of treatment suggested by our knowledge of the chemistry, physiology, pathology, and pharmacology of a given drug. Thus, when we prescribe $\frac{1}{100}$ gr. of Atropine Sulphate to check the night-sweats of phthisis we can explain (*see* Belladonna) how the perspiration is controlled. The use of Chloral Hydrate for checking tetanic convulsions and of Digitalis for the cure of cardiac dropsies are other instances of rational therapeutics.

Accessory Therapeutics. By accessory therapeutics is meant the treatment of disease, not by administration of drugs, but by other methods; such as, **change of climate, regulation of food, clothing, exercise, baths, massage,** and the like.

MATERIA MEDICA PROPER

DRUGS

A Source. Drugs may be divided, according to their source, into the following groups:—

1. *Inorganic*.—As sulphur, ozone, mineral acids, ammonia, &c.
2. *Metallic*.—As iron, copper, silver, bismuth, zinc, &c.
3. *Organic*.—(a) From the **vegetable kingdom** are obtained aconite, hyoscyamus, opium, &c.; (b) from the **animal kingdom**, cantharides, musk, cod-liver oil, glycerin, &c.
4. *Synthetic*.—As chloroform, chloral, ether, amyl nitrite, &c. These are prepared synthetically in a chemical laboratory. Some of these drugs are gradually replacing organic ones; thus, the synthetic salicylic acid is being used for the vegetable salicylic acid derived from the oil of winter-green.

B Habitat.—By habitat is meant the natural abode or locality of a plant or animal from which a drug is obtained. In other words, the drug is said to be **indigenous** to the said country or locality. Thus, Indian Hemp is indigenous to India, Aloes to Socotra or Barbados, Aconite to Britain, Quassia to Mexico, Ipecacuanha to Brazil, Musk to Tibet and Central Asia, &c.

C. Collection.—The medicinal activity of a drug depends greatly upon the habitat and the season of the year when it is gathered. Thus, Rhubarb is useless until it is six years old. China and Turkey Rhubarb are richer than those grown in India. The old Cinchona bark is richer in Quinine than the new. The wild Digitalis is more active than the cultivated variety. Socotrine and Barbados aloes are more active than other varieties.

Gathering of plants is generally best done during the dry months, but in the case of certain special plants, particular periods of the year

are specifically ordered in the B.P. Roots should be gathered in the cold weather, and those of annuals before flowering; barks of trees in the spring, and those of shrubs during autumn; leaves, when mature, before they change colour; flowers when four-fifths have expanded; fruits and seeds, when ripe, except pepper, pimento, &c.

CHARACTERS OF DRUGS

This part of *Materia Medica* is the most useful, but the least interesting to a student. To learn characters straight from a book is a useless waste of time and energy as the student is sure to forget them. He should **study them practically from specimens**, and describe them in his own words. The following points are worthy of note:—

A. Physical. Taking the B.P. or a text-book as his guide, the student should carefully examine each specimen with respect to the following:—

1. **General appearance.** Whether it is (a) *solid*, (b) *liquid*, or (c) *a powder*. If solid, its *shape, length, thickness, consistence*, &c. If a powder, whether *amorphous* or *crystalline*. If crystalline, the nature of the crystals.

2. **Colour.**—Whether it is *yellow*, like gamboge; *white*, like quinine; *red*, like iodine; *black*, like charcoal; *grey*, like grey-iron; *blue*, like copper sulphate; *green*, like oil of caput; or *colourless*, like ether, and so on.

Weight.—Whether it is *heavy* as litharge, or *light* as magnesia. Specific gravity of liquid drugs.

4. **Odour** is very difficult to define. B.P. has used various comparative terms in describing it. Thus, *fishy*, like cod-liver oil; *aromatic*, like caraway fruit or cardamom seeds; *fragrant*, like rose; *disagreeable*, like iodoform; *characteristic*, when it cannot be defined or compared, as opium; and so on. The smells of some drugs are so characteristic, that they can be easily detected by the odour alone, as ammonia, ether, chloroform, acetic acid, hydrocyanic acid, carbonic acid, creosote, acetide, iodoform, amyl nitrite, opium, musk, camom, valerian, many essential oils, &c.

5. **Taste** also is not easy to define. The article may be *sweet* like sugar; *acid*, like sulphuric acid dilute or vinegar; *fishy*, like cod-liver oil; *saline*, like common salt; *bitter*, like churata or quinine sulph.; *pungent*, like mustard or capsicum; *acid*, like balsam of Peru; *astringent*, like kino or tannic acid; *alkaline*, like aloes; *metallic*, like corrosive sublimate; and so on. Sometimes more than one term is used to denote taste. Thus, lead acetate has a sweet astringent taste, and copalba a persistent acid somewhat bitter taste.

6. Solubility—The knowledge of the solubility of drugs is essential to every practitioner of medicine, without which no prescription can be elegant and free from incompatibility. A drug may be soluble in cold water, or insoluble in cold but soluble in hot or boiling water. It may not be soluble in water at all, but soluble in alcohol, chloroform, ether, oil or glycerin. No rule can be laid down as to the solubility of drugs, except this simple one: that, *nearly all alkaline salts, and all normal neutral metallic nitrates, chlorates and acetates are soluble in water; vegetable alkaloids are mostly insoluble.*

Some drugs absorb water when exposed to air and liquefy; these are said to be **deliquescent**; as, potassium hydroxide, potassium acetate, and calcium chloride. On the other hand, many lose their water of crystallization, and a white powdery crust forms on their surface; as, ammonium and sodium carbonates. These are said to be **efflorescent**.

7. Effect of Heat.—Many drugs, when subjected to the action of heat, display one or more of the following phenomena:—

a. *Spontaneous ignition*, as phosphorus, which, unless kept under water, ignites spontaneously.

b. *Volatility*; as iodine, which, when exposed to the sun, evolves violet fumes.

c. *Fusibility*; as wax, hard paraffin and sulphur, which fuse or melt when heated (*see* Fusion, p. 11).

B. Chemical Tests.—The student must be familiar with the tests for the (1) *salts*, (2) *acids*, and (3) any special test for a *compound*. The chemical reactions of some of the *organic bodies* such as morphine, strychnine, &c., should not be lost sight of.

COMPOSITION OF DRUGS

Inorganic drugs have a definite composition which is well expressed by their names and chemical formulae. The composition of organic drugs, on the other hand, is always complex and is ascertained after considerable analytical labour. They consist chiefly of acids, bases, salts, albuminous substances, alkaloids, balsams, cellulose, colouring matters, extractive matters, ferments, glucosides, gums, gum-resins, neutral principles, fixed and volatile oils, oleo-resins, starch, sugar, &c. Some of them require a brief explanation.

Alkaloids are the active nitrogenous principles formed for the most part in the tissues of plants or animals. They may occasionally be prepared synthetically. According to Hale White, their characteristics are as follows.

(1) They are the active nitrogenous principles of organic bodies.

" (2) They are compound ammonias: that is to say, one or more atoms of hydrogen in ammonia (NH_3) are replaced by various radicals.

" (3) They combine with acids to form crystalline salts without the production of water.

" (4) They are alkaline, turning red litmus paper blue.

" (5) Very few are liquid, such as pilocarpine, conine, nicotine, sparteine, lobeline. Liquid alkaloids nearly always contain only carbon, hydrogen and nitrogen.

" (6) The solid ones are colourless, crystalline, and contain oxygen.

" (7) They are sparingly soluble in water, readily so in alcohol.

" (8) The solutions are intensely bitter.

" (9) Most of them are closely related to pyridine, and some may be synthetically prepared from pyridine bases.

The following are the common pure alkaloids of the B.P.:

Aconitine	Codeme	Physostigmine
Atropine	Hyoscyamine	Quinine
Caffeine	Morphine	Veratrine
Cocaine	Pilocarpine	Strichnine

It should be noted that the names of alkaloids in Latin terminate in **ina**, and in English **ine**. As *Atropina* (Latin), *Atropine* (English).

Acids are salts of hydrogen. Numerous organic acids are found in plants, either in combination with inorganic bases such as potassium or calcium, or in a free state.

Bases are substances which react with acids and form salts. They are of two kinds. 1. *Elementary*, to which metals belong. 2. *Compound*, such as ammonium and the alkaloids.

Glucosides are crystalline compounds found in plants, which under the action of acids, alkalis and ferments (enzymes), in the presence of water, decompose into glucose, and another body (such as alcohol, aldehydes, phenols, &c.) different in each instance; as Salicin, Saponin, Alapin, Digitalin, Digitoxin, Senegin, Strophanthin, Glycyrrhizin.

Neutral Principles are indifferent crystalline proximate principles whose chemical composition is not known. They resemble alkaloids in action. Many of them have a bitter taste, as Quassin, and are called *alkaloids or bitter principles*. As Aloin, Elaterin, Santonin, Picroxin, Quassin, &c.

Note.—Observe that, whereas the names of all alkaloids end in *ine*, those of glucosides and neutral principles end in *in*.

Balsams.—These are oleo-resins or resins containing either benzoic or cinnamic acid or both. *Benzoin, Balsam of Peru and Tolu, prepared*

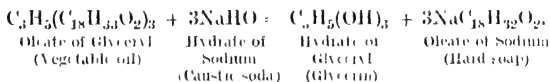
Storax, are the balsams of the B.P. Copaiba and Canada balsam do not come under this group, though they are named balsams.

Essential oils.—These are obtained by the distillation of the entire plants, flowers, fruits or seeds. Most of them are colourless when pure, and highly aromatic. They are inflammable and lighter than water, and are distinguished from the fixed oils by the fact that they leave no greasy mark on paper. Their composition is complex and varied. They contain *Aldehydes*, *Phenol derivatives*, *Ethereal salts* or *Esters*, *Ketones* associated with *Terpenes*, *Stenoptenes*, besides various resinous, fatty and acid bodies.

Fats are fixed oils which remain solid at ordinary temperatures and are obtained by expression and heat; as adeps, oil of theobroma, &c.

Fixed oils are the compounds of higher fatty acids which remain fluid at ordinary temperatures. They are extracted from seeds or fruits by expression, without heat if possible, or from animal tissues. They are called fixed oils because they **decompose when distilled**. They contain oleic, palmitic and stearic acids. As an example—Olive oil is a combination of oleic acid ($C_{18}H_{34}O_2$) with glyceryl (C_3H_5) and palmitic acid ($C_{16}H_{32}O_2$) with glyceryl; in other words, it is a mixture of two oils having the formula $C_3H_5(C_{18}H_{33}O_2)_{13}$ and $C_3H_5(C_{16}H_{31}O_2)_3$ respectively.

Fixed oils form soap and glycerin when acted upon by caustic alkalis or metallic oxides. The process is known as saponification, thus:—



Gums are complex carbohydrates having a viscid consistence. They are exudations from the stems, or branches, or both, of plants, and are composed of:

- (1) *Arabin*, soluble in water; as Gum Arabic
- (2) *Bassorin*, partially soluble in water; as Tragacanth.
- (3) *Cerasin*, or insoluble gum.

Pectin or vegetable jelly occurs in some medicinal plants and is allied to gum.

Gum-resins are the exudations from plants, containing various proportions of gums, resins and volatile oils. They form an emulsion when rubbed with water. Ammoniacum, Asafoetida, Galbanum, Gamboge, Myrrh and Scammony of the B.P. belong to this group.

Oleo-resins are solutions of resins in volatile oils as found in nature; as Copaiba, Canada Turpentine, Frankincense.

Resins are solid, brittle, non-volatile, complex substances derived from the oxidation of volatile oils. They are soluble in alkalis forming

resin soaps, and in alcohol, but insoluble in water. The resins of the B.P. are Resin, Guaiacum, Jalap, Scammony, Podophyllum, and Burgundy Pitch.

Salts are compounds of acids and bases.

Stearoptenes are solid volatile oils ; as, Camphor, Menthol, Thymol

Waxes are compounds of fatty acids and monohydrate alcohols.

IMPURITIES OF DRUGS

The impurities in a drug arise from various causes, as follows :—

1. **Imperfect Selection**—This is due to the ignorance of collectors of crude vegetable drugs, who are imperfectly acquainted with their botanical characters, and therefore fail to distinguish them from allied species : hence the **substitution** of an inferior or allied article for the genuine one. Many B.P. preparations, as ordinarily sold, are prepared from inferior ingredients and therefore do not produce the desired results. This is often the case with *Cascara Sagrada*.

2. **Imperfect Preservation** is one of the causes of **deterioration** of many drugs. Several drugs are materially affected by light and air, others by the lapse of time. Deliquescent salts and scale non preparations quickly undergo physical change unless they are kept in carefully stoppered bottles. Syrup, Ferri Iodidi and Easton's Syrup are decomposed by light. Ergot, unless carefully dried and packed in an air-tight receptacle, soon becomes mouldy and loses strength. All extracts deteriorate unless securely put in sealed pots. A hypodermic morphine tablet, if kept too long, is apt to become partially converted into apomorphine and may thus cause vomiting.

3. **Imperfect Preparation.** Impurities are of two kinds, (a) those which exist in the crude drug, (b) those which arise as by-products during the process of manufacture. They can be avoided only by scrupulous care on the part of the manufacturing pharmacist. Tests are the only means of ascertaining the purity of inorganic drugs.

4. **Adulteration** is the intentional and fraudulent admixture of foreign substances with a drug. Many drugs are tampered with by traders. All highly priced drugs are liable to adulteration. Musk is often mixed with catechu, earth, dried blood, &c. Quinine was at one time systematically adulterated, and Dr. Murrell mentions that once a large consignment of quinine was sent out to India containing not a trace of cinchona alkaloids. Powders, extracts, and liquid preparations are easily adulterated and should therefore be bought from reliable and respectable manufacturers.

The purity of an **inorganic** drug is ascertained by its chemical tests, which students are expected to be familiar with. Dr. J. M.

Bruce has prepared a table giving the common tests for impurities in **inorganic** drugs, which we quote below :-

	<i>Impurity</i>	<i>Detected by</i>
1. Impurities derived from the sources of the drug formed in the process of manufacture and imperfectly removed	Water	Bibulous paper ; dampness, loss of weight by heat.
	Organic Matter	Blackening on heating
	Sulphuric Acid	White precipitate with BaCl_2
	Hydrochloric Acid	White precipitate with AgNO_3
	Phosphoric Acid	Yellow precipitate with AgNO_3 , soluble in HNO_3 and in NH_4HO
	Carbonic Acid	Precipitate with lime water, effervescence with acids
	Sulphurous Acid	Zinc and HCl , which yield H_2S
	Nitric Acid	H_2SO_4 and FeSO_4 , which give a brown ring between the two fluids
	Calcium	White precipitate with ammonium oxalate
	Arsenium	Yellow precipitate with H_2S
2. Impurities derived from the apparatus used	Metals especially lead iron and copper	Precipitated with $(\text{NH}_4)_2\text{S}$, or H_2S , and special tests
3. Insufficient strength		Volumetric tests
4. Fraudulent adulterations	Various coloured earths	Non-volatility insolubility in HNO_3
	Cheap salts	Various tests
	Starch	Blue colour with iodine
	Sugar	Evaporation, quantitative to Effervescence with acids
	Chalk	

The purity of organic drugs can be ascertained by physical examination and quantitative test

THE BRITISH PHARMACOPEIA AND PHARMACEUTICAL PROCESSES

By a pharmacopœia we mean a book published under the authority of a recognised body, generally constituted by law, for the purpose of securing uniformity of composition and strength of medicine used in the treatment of disease. The General Medical Council of the United Kingdom, authorised by the Medical Act of 1858, issues and revises from time to time the British Pharmacopœia. The first B.P. was published in 1864, and the last in 1898. The Indian and Colonial Addendum was published in 1900. It is intended to be the standard

and guide to the preparation of drugs in the British Empire. Other countries, as the United States, Germany, France, &c., also publish their own pharmacopœias, but they differ in many respects from the British. Even hospitals have their own special pharmacopœias for speedy dispensing. Although the B.P. is the legal standard, no medical man is bound to follow it.

The Indian Pharmacopœia, though published under the orders of Government, is not followed in India; moreover, it requires revision.

The processes that are mentioned in the B.P. are called *official* or *officials*. In the following pages we shall give a brief description of some of these processes. Many of them, such as infusion, maceration, percolation, &c., belong to practical pharmacy, while many others, such as distillation, crystallization, &c., come within the range of chemistry.

Bruising or **Contusion** is the process by which tough, hard and woody, soft, elastic, and juicy substances are smashed or broken up in a roller-mill, or disintegrator, or on a small scale, in an iron mortar, so as to reduce them to a *mass* suitable for being acted upon by a solvent, either by maceration, infusion, or decoction. As Belladonna and Hyoscyamus leaves, Colchicum corns, Broom tops, Ergot, Cloves, Krameria root, &c.

Calcination or **Incineration** is the operation by which drugs are exposed to a high temperature in order that watery and volatile matters may be driven off. This is best effected by putting the drugs in a crucible over a furnace. Magnesia and Lime are prepared from their carbonates by this process.

Clarification is a process of purification in which semi-solids, such as honey, lard, &c., are first melted and then strained through flannel. It resembles the filtration of liquids.

Crystallization is the process by which substances are made to assume the form of crystals. This is effected by (a) *evaporation* of a solution containing the substances to be crystallized, as in the case of alum and sulphate of iron; (b) *fusion*, as in the case of certain metals and sulphur; (c) *sublimation*, as in the case of corrosive sublimate; and (d) *precipitation*, as in the case of iodide of mercury.

Cutting and Slicing are usually done by a woodcutter or a chopper. Roots, woods, and barks are cut or sliced before they are bruised or pulverized; as Gentian root, Mezerion bark, Sassafras root, &c. Orange peel is chopped.

Decantation is the act of pouring off the clear liquid after the insoluble residue has been allowed to settle at the bottom of the vessel.

Decoction is another name for *boiling* and requires no explanation.

Decolouration is the process by which we remove the colouring matters from alkaloidal substances, such as Atropine, Morphine, Veratrine. This is effected by treating their solutions or mixtures with dried and purified animal charcoal, and subsequent filtration.

Despumation is the process by which an organic fluid is boiled until the impurities rise to the surface as a scum, which is then removed by skimming or straining. The green extracts of the B.P. are thus purified. Syrups made by this process keep longer.

Desiccation or Drying is used in the preparation of most of the drugs of the B.P. Roots, barks, leaves, flowers, seeds, &c., are dried either in the sun or in an artificially heated drying chamber made for the purpose. Those drugs which would ferment or deteriorate in active principles by keeping, must be dried as soon as gathered. The official salts, precipitates, or filtrates are recommended to be dried in a hot-air chamber. In India and tropical countries, where the sun is very powerful, the process of drying can be very easily accomplished by exposure to the sun's rays during the hot and dry months.

Dialysis is the process of separating crystalloids from colloids by passing them through an animal membrane. This is the method of preparing Dialysed Iron which is no longer official.

Digestion is a prolonged maceration at a temperature higher than that of the air.

Distillation is the method by which a liquid is first converted into a vapour by heat, and the vapour is then condensed by cold in another vessel, called a *receiver*. This is effected by a still and condenser. There are two other methods of distillation:—(a) **Destructive or Dry distillation**, in which heat is applied to decompose a substance into volatile products, which did not exist in it originally, and which are then collected in a receiver. Acetic acid, and Wood tar are made by this process. (b) **Fractional distillation**, in which heat is applied to separate out from a mixture substances which volatilize at different temperatures.

Elutriation is the process by which a substance is pulverized and mixed with water, the coarser grains falling down to the bottom, while the lighter and finer ones are poured off with the water into another vessel, where deposition takes place slowly. By this process Creta Preparata is made. Sometimes impurities, such as sand, gravel, &c., are got rid of by this method.

Expression is the process by which we press out juices and oils from vegetable substances, as in the preparation of Succr and Green Extracts, or squeeze out the liquid from the marc as in the preparation of tinctures. For this process suitable presses are required.

Evaporation is the process of reducing the volume of a liquid by subjecting it to a heat below that of its boiling-point. It is used in the preparation of Extracts.

Filtration means the separation of insoluble matter from a liquid by passing it through calico, flannel, felt or filtering paper. When the solution is bright and clear, the filtration is good ; when muddy, it is bad, and the process should be repeated.

Fusion, Liquefaction or Melting is the process by which we melt or liquefy any solid body by heat. This is effected by putting it into a suitable vessel or crucible over a heated furnace, or on a water, steam or sand bath. We employ this process in the preparation of plasters, ointments, suppositories, caustic sticks, &c.

Granulation is the process by which a coarsely crystalline salt is converted into a granular powder by dissolving the former in water, and evaporating the solution to dryness with continuous stirring. Carbonate and Citrate of Potassium are made in this way, Sal Ammoniac and Nitre, both of which are very difficult to powder, are occasionally treated in a similar fashion.

Infusion is the process of soaking drugs in either hot or cold water. *Remember that they must not be boiled.*

Levigation is the pulverization of a solid in the presence of water, or any other liquid which does not dissolve it ; the finely comminuted particles being gathered with the washings, and allowed to deposit slowly, whilst the coarser particles are again ground with the water or liquid, and so on, until the whole of the solid is reduced to a condition of fine powder. Red precipitate may be thus reduced. It differs from elutriation in this respect, that the refuse or residue is not thrown away.

Lixiviation means the separation of a soluble salt, from a mixed or compound solid, by dissolving the latter in water, decanting the supernatant liquid into another vessel, and evaporating it to dryness, leaving the insoluble residue behind. The solution is called a "*Lye*." Pearlash is thus prepared from wood ashes.

Maceration is the process of steeping a substance in alcohol, or some similar menstruum without the application of heat, in order to dissolve out its soluble matters. The insoluble residue is called the "*marc*." Many tinctures are made in this way.

Percolation is the process of extracting soluble matters by filtration of a liquid menstruum through a porous column of powdered material. A special instrument, called a Percolator, is required.

Precipitation is a process by which a substance is separated from a solution so as to form a deposit at the bottom of the vessel.

Scaling is the process by which the scale preparations of drugs are made. It consists in spreading out in a thin layer, the concentrated solution of a drug on a glass plate, and allowing it to dry. The dried film is then separated and broken up. The scale iron preparations,

such as Ferri et Quin. Citras, Ferri et Ammon. Citras, &c., are made by this process.

Sifting is the method by which we separate finer powders from coarser ones, by means of a sieve, which is made of either wire, horse-hair or muslin, of varying degrees of closeness. The B.P. directs a drug in No. 5, 10, 20, 30, or 40 powder, and thereby means a degree of disintegration, as represented by the number of parallel wires in either transverse direction contained within the linear inch of a sieve.

When the soft pulp of fruits like figs, baels, prunes or tamarinds is required to be sifted, the operation is called "**pulping**" which requires a great force in squeezing the pulp through the sieve.

Solution.—When a substance is dissolved in a liquid, the process is known as solution. The liquid that dissolves is called a *solvent*, and the substance so dissolved a *solute*. It is *simple*, when the substance can be recovered from the solvent, without any change, and *chemical* when it cannot be so recovered.

Standardization is the method adopted to obtain a definite uniformity in the strength of certain vegetable preparations containing active or alkaloidal principles, such as the extract of nux vomica, physostigma and strophanthus, &c. Standardization may be conducted either by chemical or physiological methods.

Straining is the process of separating *visible* foreign particles by passing the liquid through an open meshwork such as muslin, tow, or wire-netting. It is quicker than filtration, but will only serve for the removal of coarse impurities.

Sublimation is the operation by which a solid is first vapourized by heat, and then the vapour is condensed as a deposit on the surface of another vessel, either *en masse*, in which case it is called a **sublimate**, as corrosive sublimate; or in a small feathery pulverulent state, known as **flowers**, as flowers of sulphur.

Trituration is the grinding of solids into powders. All salts and crystalline bodies are best powdered in a wedge-wood mortar. Vegetable substances, such as roots, barks, leaves, &c., should be thoroughly dried before they are ground in an iron mortar or in a roller-mill.

WEIGHTS AND MEASURES OF THE BRITISH PHARMACOPOEIA, IMPERIAL SYSTEM

Measures of Mass

1 Grain	gr.	
1 Ounce (Avoir.)	oz.	= 437.5 grains
1 Pound	lb.	= 16 ounces = 7000 grains

Measures of Capacity

1 Minim	min., m.	
1 Fluid Drachm	fl. drm.	= 60 minims
1 Fluid Ounce	fl. oz.	= 8 fluid drachms
1 Pint	O.	= 20 fluid ounces
1 Gallon	G.	= 8 pints

Measures of Length

1 Inch	in.	
1 Foot	ft.	= 12 inches
1 Yard	yd.	= 36 inches

Relation of Volume to Mass

1 Minim is the Volume at 62° F. of	0.9114583 grain of water
1 Fluid Drachm „ „	54.6875 grains of water
1 Fluid Ounce „ „	437.5 grains of water
1 Pint „ 1.25 pounds or	8750.0 grains of water
1 Gallon „ 10 pounds or	70000.0 grains of water
109.7143 minims * =	the volume at 62° F. of 100 grams of water

WEIGHTS AND MEASURES OF THE METRIC SYSTEM**Measures of Mass**

1 Milligramme	the thousandth part of one gm., or 0.001 gm.
1 Centigramme	the hundredth part of one gm., or 0.01 gm.
1 Decigramme	the tenth part of one gm., or 0.1 gm.
1 Gramme	(weight of one millilitre of dis-) 1.0 gm. (filled water at 4° C. (39.2° F.))
1 Dekagramme	ten grammes or 10.0 gm.
1 Hectogramme	one hundred grammes or 100.0 gm.
1 Kilogramme	= one thousand grammes or 1000.0 gm.

Measures of Capacity

1 Millilitre	= the Volume at 4° C. of 1 gm. of water
1 Centilitre	„ „ of 10 gm. of water
1 Decilitre	„ „ of 100 gm. of water
1 Litre	„ „ of 1000 gm. (1 Kilog.)

* Taken as 110 minims throughout the Pharmacopœia.

Measures of Length

1 Millimetre	=	one thousandth part of one metre or 0.001 metre
1 Centimetre	=	one hundredth part of one metre or 0.01 metre
1 Decimetre	=	one tenth part of one metre or 0.1 metre
1 Metre		1.0 metre

Relation of Cubic measures to Measures of Capacity.

1 Cubic Centimetre	=	0.0009984 millilitre
1 Cubic Decimetre	=	0.0009984 litre, or 1000 cub. centim.

1.00016 Cubic Centimetres = 1 millilitre

1.00016 Cubic Decimetres = 1 litre, or 1000 millilitres

**RELATION OF THE IMPERIAL STANDARDS TO
THE METRIC STANDARDS****Standards of Mass**

1 Pound	=	453.59243 grammes
1 Ounce	=	28.34955 grammes, or 28.35 gm. nearly
1 Grain	=	0.064798918 gramme, or 0.0648 gm. nearly

Standards of Capacity

Gallon	=	4.5459631 litres
Pint	=	0.5682454 litre or 568.336 cubic centimetres nearly
Fluid Ounce	=	0.0284123 litre or 28.417 cubic centimetres nearly
Fluid Drachm	=	0.003552 litre or 3.552 centimetres nearly
Minim	=	0.000059 litre or 0.059 cubic centimetre nearly

Standards of Length

1 Yard	=	0.914399 metre
1 Foot	=	0.30480 metre = 30.48 centimetres
1 Inch	=	0.02540 metre = 25.40 millimetres

RELATION OF THE METRIC STANDARDS TO THE IMPERIAL STANDARDS

Standards of Mass

1 Milligramme	=	0.015 grain nearly
1 Centigramme	=	0.154 grain nearly
1 Decigramme	=	1.543 grains nearly
1 Gramme	=	15.4323564 grains
1 Kilogramme	=	2 lb. 3 oz. 119.8564 gr. or 15432.3564 grains

Standards of Capacity

1 Cubic Centimetre	=	16.9 minims nearly
1 Litre	=	17.5980 pints, or 1 pint 15 fl. oz. 1 fl. dr. 34 m. nearly

Standards of Length

1 Millimetre	=	0.039370 inch
1 Centimetre	=	0.39370 inch
1 Decimetre	=	3.9370 inches
1 Metre	=	39.370113 inches, or 1 yd. 3.37 inches nearly

Formulae for Converting from one Scale to another

To convert grammes into grains	..	..	×	15.432
.. .. ounces (Avoir.)	..	..	×	0.03527
.. kilogrammes into pounds	..	..	×	2.2046
.. grains into grammes	..	..	×	0.0648
.. avoird. ounces into grammes	..	..	×	28.35
.. troy ounces into grammes	..	..	×	31.104
.. cubic centimetres into fluid ounces imperial	..	..	×	0.0352
.. litres into fluid ounces imperial	..	..	×	35.2
.. fluid ounces into cubic centimetres	..	..	×	28.42
.. pints into litres	..	..	×	0.568
.. metres into inches	..	..	×	39.37
.. inches into metres	..	..	×	0.0254

Indian Domestic Weights

1 Rupee or 1 tola	—	180 grains
$\frac{1}{2}$ " $\frac{1}{2}$ "	—	90 "
$\frac{1}{4}$ " $\frac{1}{4}$ "	—	45 "
$\frac{1}{8}$ " $\frac{1}{8}$ "	—	22.5 "
1 copper pie	—	100 "

OFFICIAL OR PHARMACOPŒIAL PREPARATIONS

The official preparations are sometimes called Galenical, after the celebrated physician Galen, but this term is now a misnomer, as with the advance of pharmacy, many drugs have come into use which were unknown in Galen's days.

Few drugs can be administered in their natural state. They are either too nauseous, too bulky, or contain some principles which are injurious to life or health. They are, therefore, submitted to certain processes, prescribed by the British Pharmacopœia, in order to render them fit for administration, and also to help their preservation and storing, so as to maintain an uninterrupted supply during all seasons of the year. In the following pages we have given all the *official preparations* of the B.P. of 1898 in a tabular form, with their compositions, strengths, doses, and in many instances, their actions and uses, so as to enable a student to commit them to memory with as little trouble as possible. But it is only by repeated references that he will be able to master thus, the most difficult part of Materia Medica.

Aceta. Vinegars are solutions of drugs in acetic acid, *not in Vinegar*. They are three in number :-

Acetum	Preparation	Strength	Dose	Action
Cantharidis	Cantharides bruised 2 ozs., glacial acetic acid, distilled water equal parts, to 1 pt., by maceration and percolation	1 in 10	Used externally	Epispastic, for blisters
Ipecacuanhæ	Liquid extract of Ipecac 1 oz., alcohol (90 p.c.) 2 ozs., and diluted acetic acid 17 ozs., or 1 pt., by mixture		10 to 1	Expectorant in colds, coughs and bronchitis
Scillæ	Squill bruised 2½ ozs. and diluted acetic acid to 1 pt., by maceration	1 in	10 to 30 m	Expectorant and diuretic

OFFICIAL OR PHARMACOPŒIAL PREPARATIONS 17

Acida Diluta. Diluted Acids are strong acids diluted with distilled water. They are eight in number :—

Acidum	Preparation	Dose	Action and use
Aceticum Dil.	Acetic acid 2½ fl. ozs., water to 1 pint	½ to 2 drs.	Refrigerant and diuretic. To allay thirst in fevers, cholera, and to reduce temperature
Hydrobromicum Dil.	A solution containing 10 p.c. of hydrogen bromide by weight	15 to 60 ms.	Hypnotic and sedative. It is mixed with quinine to prevent cinchonism
Hydrochloricum Dil.	Hydrochloric acid 6 fl. ozs., water to 1 pint	5 to 20 ms.	Refrigerant and tonic. In acid dyspepsia, chronic gastric complaints, fevers, &c.
Hydrocyanicum Dil.	A solution containing 2 p.c. of hydrogen cyanide by weight	2 to 6 ms.	Sedative. A deadly poison. In vomiting, painful gastric disorders, hiccough, &c.
Nitricum Dil.	Nitric acid 3 fl. ozs., and 7 fl. drs., water to 1 pint	5 to 20 ms.	Tonic, cholagogue. In phosphatic calculi as injection, dyspepsia
Nitrohydrochloricum Dil.	Nitric acid 3 fl. ozs., hydrochloric acid 4 fl. ozs., water 25 fl. ozs.	5 to 20 ms.	Tonic, refrigerant, cholagogue. In dyspepsia, congestion of liver
Phosphoricum Dil.	Phosphoric acid 3 fl. ozs., water to 1 pint	5 to 20 ms.	Tonic, refrigerant. In rickets, diabetes, phosphatic diathesis
Sulphuricum Dil.	Sulphuric acid 1 fl. oz. and 5½ fl. drs., water to 1 pint	5 to 20 ms.	Tonic, astringent. To check hæmorrhages, diarrhœa, cholera, sweating of phthisis

The dosage of all varies from 5 to 20 minims, except—

Acid. Hydrocyanic. Dil. **2 to 6 ms.** ; Acid. Hydrobromic. Dil. 15 to 60 ms. ; and Acid. Acetic. Dil. ½ to 2 drs.

Acidum Aromaticum. Aromatic Acid.—An acid liquid containing aromatics. There is only one preparation in the B.P. :

Acidum Sulphuricum Aromaticum. *Syn.*—*Elixir of Vitrol.* Mix gradually sulphuric acid 3 ozs. with alcohol (90 p.c.) 29½ ozs., and add Tr. Zingiberis 10 ozs. and Sp. Cinnamomi ½ oz. *Dose.*—5 to 20 ms. freely diluted.

Adeps and Adeps Lanæ. Lard and wool fat. Two preparations, as follows :—

Adeps Benzoatus.—Prepared Lard 16 ozs., powdered Benzoin 210 grs. ; melt the lard in a water-bath, mix and strain.

Adeps Lanæ Hydrosus. *Syn.*—*Lanoline.* Wool fat 7, distilled water 3. Mix by trituration in a warm mortar.

Aquæ. Waters.—With the exception of distilled water and Aq. Chloroformi all aquæ are weak and simple solutions of volatile oils in distilled water obtained either by distillation or by simple solution. They are fifteen in number:—

Aqua	Preparation	Dose	Action
Anethi . . (<i>Dill water</i>)	Dill fruit 1 lb., and water 2 gals. distilled to 1 gal	$\frac{1}{2}$ to 2 ozs.	Carminative. Efficacious in infantile colic
Anisi . .	Anise fruit 1 lb. and water 2 gals., distilled to 1 gal.	$\frac{1}{2}$ to 2 ozs.	An antispasmodic and carminative vehicle
Aurantii Floris	Commercial water as obtained by distillation of flowers of bitter-orange. It is a saturated solution of the volatile oil of fresh flowers	1 to 2 ozs.	A flavouring agent
Camphoræ .	Camphor 70 grs., alcohol (90 p.c.) <i>q.s.</i> and distilled water 1 gal. by solution. Strength $\frac{1}{2}$ gr. in 1 oz.	1 to 2 ozs.	Stimulant and antispasmodic. As a vehicle
Carui . .	Caraway fruit 1 lb. and water 2 gals., distilled to 1 gal.	1 to 2 ozs.	A carminative vehicle
Chloroformi .	Chloroform 30 ms. and distilled water 25 ozs., by solution. Its strength is 1 in 400, <i>i.e.</i> half of the same of <i>B.P.</i> 1885	1 to 2 ozs.	A flavouring agent
Cinnamomi .	Cinnamon bark bruised 1 lb. and water 2 gals., distilled to 1 gal.	1 to 2 ozs.	A carminative vehicle
Destillata .	Distilled from good natural potable water	—	A vehicle
Fœniculi .	Fennel fruit 1 lb. and water 2 gals., distilled to 1 gal.	1 to 2 ozs.	Antispasmodic for infantile colic
Laurocerasi .	Fresh Cherry Laurel leaves 1 lb., and water 2½ pts.; by distillation and standardization. Contains $\frac{1}{16}$ p.c. of hydrogen cyanide	$\frac{1}{2}$ to 2 drs. <i>B.P.</i>	Nervine, gastric and cutaneous sedative
Menth. Pip. .	Oil of Peppermint 77 ms. and water 1½ gals., distilled to two-thirds	1 to 2 ozs.	An antispasmodic and carminative vehicle

Aqua	Preparation	Dose	Action
Menth. Viridis	Oil of Spearmint 77 m℥. and water 1½ gals., distilled to two-thirds	1 to 2 ozs.	An antispasmodic and carminative vehicle
Pimentæ	Pimento bruised 8 ozs. and water 2 gals., distilled to 1 gal.	1 to 2 ozs.	A carminative vehicle
Rosæ	Commercially distilled from the flowers of <i>Rosa Damascena</i> . It is a saturated solution of the volatile oil	1 to 2 ozs.	A flavouring agent
Sambuci	Fresh Elder flowers 10 lbs. or an equivalent quantity of flowers preserved in salt while fresh, and water 5 gals., distilled to one-fifth	Used externally	A fragrant basis for skin lotions

The following points should be remembered :—

1. All aquæ are distilled except two, viz. :—Aq. Camphoræ and Aq. Chloroformi.

2. Aq. Aurantii Flor. and Aq. Rosæ are saturated solutions and must be diluted with thrice their volume of water immediately before use.

3. The doses of all aquæ are from ½ to 2 fl. ozs., except **Aq. Lauro-cerasi**, the dose of which is only ½ to 2 drs. because it contains Hydrocyanic acid.

Chartæ. Papers.—Cartridge papers coated with active medicinal agents, and used like a plaster. There is only one in the B. P.

Charta Sinapis. Mustard Paper :—Remove the fixed oil from black and white mustard seeds with benzol by percolation, and mix the dried and powdered residue 75 grs. with 5 drs. of solution of india-rubber. Spread this mixture on paper and dry. The paper should be dipped in tepid water before use. This is a very unsatisfactory preparation, and should only be used when a freshly-made mustard plaster is unobtainable.

Collodia. Collodions are solutions of drugs in collodion, or solution of pyroxylin in ether and alcohol. They are three in number :

Collodium	Ingredients	Action and use
Collodium	Pyroxylin 1 oz., ether 36 ozs., alcohol (90 p.c.) 12 ozs.	A protective to wounds, &c.
Flexile	Collodion 12 ozs., Canada balsam ½ oz., castor oil ¼ oz.	Does not crack. An excellent application for erysipelas, fissured nipples, scalp wounds, sprains, &c.
Vesicans	Blistering liquid 20 ozs., pyroxylin ½ oz.	An effective vesicant

Confectiones. Confections, Electuaries or Conserves are soft preparations of drugs, made into a paste with sugar or honey, either to give them a pleasant and agreeable taste or to preserve them. There are only four in the B.P. :—

Confectio	Ingredients	Strength	Dose	Action and use
Piperis (Ward's paste) Rosæ Gallicæ Sennæ	Powdered black pepper 2 ozs., caraway fruit 3 ozs., honey 15 ozs. Fresh red-rose petals 1 lb., refined sugar 3 lbs. Powdered senna 7 ozs., powdered coriander 3 ozs., figs 12 ozs., tamarinds 9 ozs., cassia pulp 9 ozs., prunes 6 ozs., extract of liquorice 1 oz., sugar 30 ozs., water $q\ s.$	1 in 10 1 in 4 1 in 11	60 to 120 grs. - 60 to 120 grs.	Stimulant, car- minative. In hemorrhoids. As a basis for pill mass and linctus. A safe and ele- gant laxative in chronic consti- pation
Sulphuris	Sublimed sulphur 4 ozs., acid. pot. tar- trate 1 oz., traga- canth 18 grs., syrup 2 ozs., tincture of orange $\frac{1}{2}$ oz., glycerin $1\frac{1}{2}$ oz.	1 in $2\frac{1}{2}$	50 to 120 grs.	A gentle laxative and alterative in piles

Decocta. Decoctions.—Three in number. They are vegetable solutions prepared by boiling with distilled water and straining. The decoction of Aloe is the only one made in a covered pot.

Decoctum	Ingredients	Strength	Dose	Action and use
Aloes Co	Extract of Barbados aloes $\frac{1}{2}$ oz., myrrh, saffron and potass carbonate of each $\frac{1}{4}$ oz., extract of liquorice 2 ozs., com- pound tincture of cardamoms 15 ozs., water to 50 ozs.	1 in 100	$\frac{1}{2}$ to 2 ozs	Cathartic and emmenagogue. In chronic con- stipation, amenorrhœa, and obstinate diarrhœa (Whitla)
Granati Corticis	Powdered pomegran- ate bark 4 ozs., water to 1 pt.	1 in 5	$\frac{1}{2}$ to 2 ozs	Astringent and anthelmintic. In diarrhœa, dysentery and tapeworm
Hæma- toxyli	Logwood in chips 1 oz., cinnamon bark bruised 70 grs., water to 1 pt.	1 in 20	$\frac{1}{2}$ to 2 ozs.	An astringent vehicle

Effervescent Granular, or those preparations that effervesce when mixed with water. All are granular except effervescent Tartarated Soda Powder, which being a powder is given under the head of powders in the B.P. They are prepared by the admixture of acids and alkalis with or without sugar. Caffeine Citrate, Mag. Sulphate, and Sodium Citro-tartrate contain sugar, while Sodium Phosphate, Sodium Sulphate, and Lithium Citrate do not.

All effervescing preparations are agreeable to take.

The following are the B.P. granular effervescing preparations, the quantities of which are given in ounces :—

Effervescent	Composition	Dose	Action and use
Caffeine Citrate	Sodium bicarb. 51, tartaric acid 27, citric acid 18, sugar 54, caffeine citrate 4	60 to 120 grs.	Cardiac tonic, diuretic. In headache and migraine
Lithium Citrate	Sod. bicarb. 58, tartaric acid 31, citric acid 21, lithium citrate, 5	60 to 120 grs.	Diuretic
Magnesium Sulphate	Mag. sulph. 50, sodium bicarb. 36, tartaric acid 19, citric acid 12½, sugar 10½	60 to 240 grs., ½ to 1 oz. for a single dose	Antacid and cathartic
Sodium Citro-tartrate	Sod. bicarb. 51, tartaric acid 27, citric acid 18, sugar 15	60 to 120 grs.	Refrigerant, laxative and antacid
Sodium Phosphate	Sod. phosphate 50, sod. bicarb. 50, tartaric acid 27, citric acid 18	60 to 120 grs., ¼ to ½ oz. for a single dose	A mild antacid, aperient in large doses, diuretic and antilithic in small doses
Sodium Sulphate	Sod. bicarb. 50, sod. sulph. 50, tartaric acid 27, citric acid 18	60 to 120 grs., ¼ to ½ oz. for a single dose	Hydragogue purgative
Tartarate Soda powder	Described in the table of powders (<i>q.v.</i>)	—	Purgative

Emplastra. Plasters.—Twelve in number. They are made of adhesive substances spread upon cloth or leather so as to adhere to the skin. They are applied for the purpose of holding medicinal substances in contact with the body, of acting as a protective and support, or of bringing the edges of a wound together.

MATERIA MEDICA PROPER

Emplastrum	Materials used	Strength	Action and use
Ammoniaceum Hydrargyro	Ammoniacum 12 ozs., mercury 3 ozs., olive oil 56 grs., sublimed sulphur 8 grs.	1 of Hg. in 5	Resolvent and a local stimulant. In glandular swelling, syphilitic nodes and chronic synovitis
Belladonnæ	Liquid extract of bella- donna 4 ozs., resin plaster 5 ozs	2 in 3 or 5 p.c. of alkaloids	A local anodyne. In lumbago, neuralgia, cardiac pain, swollen and painful glands
Calefaciens . (<i>Warming plaster</i>)	Cantharides in coarse powder, yellow bees- wax, resin, each 4 ozs., resin plaster 3½ lbs., soap plaster 2 lbs., boiling water 1 pt.	1 in 24 of cantharides	A local stimulant
Cantharidis	Cantharides in powder 3½ ozs., yellow bees- wax 2 ozs., lard 2 ozs., resin 2 ozs., soap-plaster ½ oz.	1 in 8 neatly	Vesicant. Used for blistering
Hydrargyri .	Mercury 3 ozs., olive oil 56 grs., sublimed sulphur 8 grs., lead plaster 6 ozs	1 in 3	Resolvent
Menthol .	Menthol 1½ ozs., yellow beeswax 1 oz., resin 7½ ozs	3 in 20	A local analgesic. In neuralgic pains
Opii .	Opium in fine powder 1 oz., resin plaster 9 ozs	1 in 10	A local anodyne
Ficis .	Burgundy pitch 26 ozs., frankincense 13 ozs., resin 4½ ozs., yellow beeswax 4½ ozs., olive oil 2 ozs., water 2 ozs.	1 in 2	Rubefacient. Applied to chest for chronic pulmonary diseases, to loins for lumbago and rheumatism
Plumbi .	Lead oxide 1 lb., olive oil 2 lbs., water 16 ozs or q.s.	—	Sedative and pro- tective
Plumbi Iodidi	Lead iodide 2 ozs., lead plaster 1 lb., resin 2 ozs.	1 in 10	Alterative and resol- vent. In chronic in- dolent enlargements
Resinæ . (<i>Adhesive plaster</i>)	Resin 4 ozs., lead- plaster 2 lbs., hard soap 2 ozs.	1 in 9½	Adhesive. For strap- ping wounds, ulcers
Saponis .	Hard soap 6 ozs., lead plaster 2½ lbs., resin 1 oz.	1 in 7	Protective. In bed- sores, boils and corns

Extracta. Extracts.—Thirty-nine in number. Prepared mostly by evaporating fresh juice or soluble ingredients of plants. According to their mode of preparation, the Extracts can be grouped under seven heads, *viz.* :—1. Fresh Extracts. 2. Green Extracts. 3. Aqueous Extracts. 4. Liquid Extracts. 5. Alcoholic Extracts. 6. Ethereal Extracts. 7. Dry Extracts. But, if we are to divide them according to their physical characters, they come under three groups, *viz.* :— (1) **Hard, dry or brittle**, (2) **Semisolid**, and (3) **Liquid**.

1. **Fresh Extracts** are prepared by heating the expressed juice to 212° F. to coagulate the albumen, and by filtering and evaporating the filtrate at 160° F. They are two in number :—

Extractum	Source	Process	Menstruum	Dose
Colchici	Juice of fresh corms	Ex. & E.	nil.	$\frac{1}{4}$ to 1 gr.
Taraxaci	Juice of fresh roots	Do.	nil.	5 to 15 grs.

2. **Green Extracts** are generally prepared by bruising and pressing out the juice of drugs, and then heating it to 130° F. The green colouring matter having been filtered off and laid aside, the strained fluid is heated to 200° F. to coagulate the albumen, which would decompose the extract if retained. The albumen is then removed by filtration and the filtrate evaporated on a water-bath to the consistence of a syrup. The green colouring matter is now passed through a hair sieve and added to the filtrate, and the whole after being stirred is evaporated to the consistence of a soft extract at a temperature below 140° F.

Extractum	Source	Process	Menstruum	Dose
Belladonnæ viride	Juice of fresh leaves and young branches	Ex. & E.	nil	$\frac{1}{4}$ to 1 gr.
Hyoscyami viride	Juice of fresh leaves, flowering tops and young branches.	Do.	nil	2 to 8 grs.

3. **Aqueous or Watery Extracts** are prepared by dissolving, macerating, infusing or boiling drugs in cold and hot distilled water, and evaporating the solution, infusion or decoction, as the case may

Note. Ex. = Expression ; E. = Evaporation.

be, to the consistence of a soft extract. They are seven in number, as under :—

Extractum	Source	Process	Menstruum	Dose
Aloes Barb.	Barbados aloes 1 lb.	S. & E.	Boiling water	1 to 4 grs.
Anthemidis	Dried flowers 1 lb. and oil of Chamomile 15 ms.	D. & E.	water	2 to 8 grs.
Cascaræ	Powdered bark	M.P. & E.	water	2 to 8 grs.
Sagradæ				
Gentianæ	Sheed root dried	I.D. & E.	water	2 to 8 grs.
Glycyrrhizæ	Dried root 1 lb.	M. & E.	water	—
Kramerizæ	Dried root	M.P. & E.	water	5 to 15 grs.
Opii	Sheed opium 1 lb.	S & E.	water	$\frac{1}{4}$ to 1 gr.

The B.P. has given no dose for Ext. Glycyrrhizæ though in the form of "stuck liquorice" large quantities of it are consumed as a domestic remedy for coughs and colds. The extracts of Aloes Barb., Cascara Sagrada, and Krameria are *solid* and the rest *semisolid*.

4. **Liquid Extracts** are prepared either from *concentrated infusions* of drugs, with alcohol added for their preservation, or alcoholic extracts dissolved in diluted alcohol. Opium alone is made from its semisolid extract. They are seventeen in number, as under :—

Extractum	Ingredients	Alcohol P.C. in the men- struum	Process	Strength	Dose
Belladonnæ Liquid.	Belladonna root		M. & P.	$\frac{1}{2}$ gr in 110 ms	
Cascaræ Sagradæ Liq.	Bark 20 ozs.	90	M. & P.	1 in 1 (alkaloids)	$\frac{1}{2}$ to 1 dr
Cimicifugæ Liq.	Cimicifuga 20 ozs.	90	M. & P.	1 in 1	5 to 30 ms
Cinchonæ Liq.	Red Cinchona bark 20 ozs., hydrochloric acid 5 drs., glycerin $2\frac{1}{2}$ ozs., and water q s.	90	M. & P.	$\frac{5}{8}$ gr in 110 ms (alkaloid)	5 to 15 ms
Cocæ Liq.	Leaves 20 ozs.	60	M. & P.	1 in 1	to 1 dr
Ergotæ Liq.	Ergot 20 ozs., and water $7\frac{1}{2}$ pts	90	I & E.	1 in 1	10 to 30 ms

Note. D. = Decoction. E. = Evaporation. Ex = Expression. I. In fusion M. = Maceration. P. = Percolation. S. = Solution.

PHARMACOPŒIAL PREPARATIONS

Extractum	Ingredients	Alcohol P.C. in the men- struum	Process	Strength	Dose
Glycyrrhizæ Liq.	Root 20 ozs., water 5 pts.	90	M. & E.	s. g. 1.200	$\frac{1}{2}$ to 1 dr.
Hamamelidis Liq.	Leaves 20 ozs.	45	P.	1 in 1	5 to 15 ms.
Hydrastis Liq.	Hydrastis 20 ozs.	45	P.	1 in 1	5 to 15 ms.
Ipecacuan- hæ Liq.	Root 1 lb., slacked lime 700 grs.	90	P.	2 to 2 $\frac{1}{4}$ grs. in 110 ms. (alkaloids)	$\frac{1}{2}$ to 2 ms. as an ex- pectorant, 15 to 20 ms. as an emetic
Jaborandi Liq.	Leaves 20 oz.	45	P.	1 in 1	5 to 15 ms.
Nucis Vomicæ Liq.	Seeds 1 lb.	70 & 90	M. & P.	1 $\frac{1}{2}$ grs. in 110 ms. (strych- nine)	1 to 3 ms.
Opii Liq.	Extract of opium $\frac{1}{4}$ oz. and water 16 ozs.	90	S.	$\frac{1}{4}$ gr. in 110 ms. (morphine)	5 to 30 ms.
Pareiræ Liq.	Parera root	90	M. & P.	extrac- tives	$\frac{1}{2}$ to 2 drs.
Sarsæ Liq.	Sarsaparilla powder 20 ozs., glycerin 2 ozs.	20	P.	1 in 1	2 to 4 drs.
Taraxaci Liq.	Root 20 ozs.	60	M.	1 in 1	$\frac{1}{2}$ to 2 drs.

From the above table it will be gathered that all the liquid extracts require alcohol of various strengths, either for their preparation or for their preservation. Liquid extract of Male Fern being prepared with ether is given in the table of **Ethereal Extracts**.

In India and tropical countries, any Liquid Extract containing less than one fourth of its weight of alcohol (90 p.c.) may have the same increased to one-fourth for better preservation.

5. **Alcoholic Extracts** are prepared by treating the drugs with alcohol of different strengths and *evaporating* the tincture afterwards. Properly speaking, they are eleven in number, but Ext. Euonymi Siccum and Ext. Strophanthi being in the form of a dry powder, though prepared with alcohol, are grouped under the head of **Dry**

Note. E. = Evaporation. I. = Infusion. M = Maceration. P. = Percolation. S. = Solution.

Extracts. Many Liquid Extracts, though prepared with the aid of alcohol, are not given under Alcoholic Extracts.

Extractum	Ingredients	Process	Menstruum	Dose
Bellad. Alcohol.	Liquid Extract of Belladonna	E.	Milk-sugar	to 1 gr.
Cannabis Ind.	Dried flowering tops	P.	Alcohol 90%	$\frac{1}{4}$ to 1 gr.
Colocynth Co.	Colocynth pulp 6 ozs., extract of Barbados aloes 12 ozs., scam- mony resin 4 ozs., curd soap in shavings 4 ozs., and cardamom in powder 1 oz.	M.	Alcohol 60% 1 gallon	2 to 8 grs.
Ergotæ . (<i>Ergotin</i>)	Ergot 20 ozs., sodium carbonate 175 grs.	P.	Alcohol 60% q.s., water q.s., acid hydrochlor. dil. 7½ drs.	2 to 8 grs.
Jalapæ .	Powdered root 1 lb.	M. &	Alcohol 90% 4 pts., water 1 gallon	2 to 8 grs.
Nucis Vomiceæ	Liquid extract of nux vomica 11 ozs. (5% strychnine)	E.	Milk - sugar q.s. (stan- dardized)	$\frac{1}{4}$ to 1 gr.
Physostigmatis	Dried powdered bean 1 lb.	M. &	Alcohol 90% 4 pts., milk- sugar q.s.	$\frac{1}{4}$ to 1 gr.
Rhei .	Dried powdered root	M. &	Alcohol 60%	2 to 8 grs.
Stramonii	Dried powdered seeds	P.	Alcohol 70%	$\frac{1}{4}$ to 1 gr.

6. **Ethereal Extracts** are prepared by percolating dry drugs with ether. There is only 1 in the B.P. :—

Extractum	Ingredient	Process	Menstruum	Strength	Dose
Filicis Liq.	Dry rhizome	P.	Ether	10 yield 1	45 to 90 ms.

7. **Dry Extracts**, sometimes called **Abstracts**, are alcoholic extracts mixed with an inert powdered substance and then dried and powdered. They are two in number :—

Extractum	Source	Process	Menstruum	Dose
Euonymi Siccum (<i>Euonymin</i>)	Powdered bark	P.	Alcohol 45% q.s. (Calc. phosp. q.s. to standardize)	1 to 2 grs.
Strophanthi .	Dried strophanthus seeds	P.	Purified ether q.s., alcohol 90% q.s., (milk-sugar q.s. to standardize)	$\frac{1}{4}$ to 1 gr

Phosphate of lime and sugar of milk are used to bring them to a standard strength.

Glycerina. **Glycerins** are solutions of drugs in plain glycerin or glycerin and water. They are nine in number:—

Glycerinum	Ingredients	Strength by weight	Strength by volume	Action and use
Acidi Borici	Boric acid powder 6 ozs., glycerin <i>q.s.</i> to 20 ozs. by weight	6 in 20	6 in 16	A local antiseptic. In aphthous sores
Acidi Carbolic	Phenol 1 oz., glycerin <i>q.s.</i> to 5 ozs.	1 in 6½	1 in 5	A local antiseptic and parasiticide. In tinea
Acidi Tannici	Tannic acid 1 oz., glycerin <i>q.s.</i> to 5 ozs.	1 in 6½	1 in 5	A local astringent. In sore-throat and tonsillitis
Aluminis	Alum in powder 1 oz., water 7 drs., glycerin <i>q.s.</i> to 6 ozs.	1 in 7½	1 in 6	A local astringent. In enlarged tonsils
Amyli	Starch 1 oz., glycerin 6½ ozs., water 1½ ozs.	1 in 10	1 in 9	A local emollient
Boracis	Borax 1 oz., glycerin 6 ozs.	1 in 8½	1 in 6¾	A local antiseptic and emollient
Pepsini	Pepsin 800 grs., hydrochloric acid 110 ms., glycerin 12 ozs., water <i>q.s.</i>	—	5 grs. in 1 dr.	A digestive adjuvant. (<i>Dose.</i> 1 to 2 drs.)
Plumbi Subacetatis	Lead acetate 5 ozs., lead oxide 3½ ozs., glycerin 1 pt., water 12 ozs.	1 in 6	1 in 4	A local astringent and sedative
Tragacanthæ (a substitute for Proctor's paste)	Tragacanth ½ oz., glycerin 1½ ozs., distilled water ½ oz.	1 in 5½	—	A good pill excipient

Though the official glycerins are intended to be simple solutions, yet *Glyc. Plumbi Subacetatis* and *Glyc. Tragacanthæ* are not so. The former is a chemical solution and the latter a pseudo-solution. *Glyc. Acidi Tannici* is now prepared by simple trituration without the aid of heat; consequently the product is pale. *Glyc. Amyli* cannot be made on a water-bath, because the heat is not high enough to burst the starch granules. Use a porcelain dish with a piece of wire gauze between it and the flame, and do not stop stirring until the solution becomes perfectly clear, when the process is complete. *Glyc. Boracis* is now only triturated instead of being triturated or heated according to the dispenser's choice as formerly ordered. *Glyc. Acidi Borici* is an imitation of the patented Boro-Glyceride, but is somewhat weaker.

Linimentum	Preparation	Strength	Action and use
Terebinthinæ	Soft soap 1½ oz., camphor 1 oz., and oil of turpentine 13 ozs.; water 5 ozs. or <i>q.s.</i> , to 1 pt., by maceration and trituration	13 in 20	Irritant and rubefacient
Terebinthinæ Aceticum	Oil of turpentine 4 ozs., glacial acetic acid 1 oz., and liniment of camphor 4 ozs.; by mixture	4 in 9	Powerful rubefacient

Liquores. Solutions are solutions of vegetable, animal or inorganic substances in distilled water, either alone or with other solvents. Three preparations, namely, *Liqr. Pancreatis*, *Liqr. Thyroidei* and *Liqr. Epispastici* are obtained from the animal kingdom. *Liqr. Epispastici* is prepared with acetic ether. Most of the vegetable solutions are made with the aid of alcohol of various strengths. They are fifty-three in number:—

Liquor	Preparation	Strength	Dose
Acid. Chromici	Chromic anhydride 1 oz., and water 3 ozs.; by solution	25 p.c. anhydrous acid	Used externally
Ammoniacæ	Strong solution of ammonia 1 pt. and water 2 pts.; by mixture	1 in 3 or (10 p.c.)	Used externally
Ammoniacæ Fortis	—	32.5 p.c. by weight	Used externally
Ammonii Acetatis	Ammonium carbonate 1 oz., acetic acid <i>q.s.</i> (to neutralize), and water to 1 pt.; by solution	6½ p.c. (nearly)	2 to 6 drs.
Ammonii Citratis	Ammon carbonate 1½ ozs., citric acid 2½ ozs. (to neutralize), water to 1 pt.	16 p.c. (nearly)	2 to 6 drs.
Arsenicalis (<i>Fowler's solution</i>)	Arsenious anhydride in powder 87½ grs., potass. carb. 87½ grs., compound tincture of lavender 5 drs. and water to 1 pt.	1 gr. in 110 ms.	2 to 8 ms.
Arsenici Hydrochloricus	Arsenious anhydride in powder 87½ grs., hydrochloric acid 2 drs. and water to 1 pt.	1 gr. in 110 ms.	2 to 8 ms.

Liquor	Preparation	Strength	Dose
Arsenii et Hydrargyri Iodidi	Arsenious iodide 87½ grs., mercuric iodide 87½ grs. and water to 1 pt.; by trituration and solution	1 gr. in 110 ms.	5 to 20 ms.
Atropinæ Sulphatis	Atropine sulphate 17½ grs., salicylic acid 2 grs., and water 4 ozs.; by solution	1 gr. in 110 ms.	½ to 1 m.
Bismuthi et Ammonii Citratis (<i>Liqr. Bismuthi</i>)	Bismuth oxynitrate 613 grs., potassium citrate 613 grs., potassium carbonate 175 grs., nitric acid 1 oz., solution of ammonia <i>q.s.</i> water to 1 pt.; by solution and filtration	3 grs. of bismuth oxide in 1 dr.	½ to 1 dr.
Calcis	Calcium hydroxide 2 ozs., and water <i>q.s.</i> to 1 gal.	½ gr. in 1 oz.	1 to 4 ozs.
Calcis Chlorinatæ	Chlorinated lime 1 lb. and water 1 gal.; by mixture and filtration	About 3 p.c. chlorine when fresh	—
Calcis Saccharatus	Calcium hydroxide 1 oz., refined sugar in powder 2 ozs., and water 1 pt.; by mixture and decantation	8 grs. in 1 oz. (nearly)	20 to 60 ms.
Calumbæ Conc.	Calumba root powdered 10 ozs., alcohol (90 p.c.) 4½ ozs., and water to 1 pt.; by maceration	1 in 2	½ to 1 dr.
Caoutchouc	India-rubber 1 oz., benzol 10 ozs. and carbon bisulphide 10 ozs., by maceration	1 in 20	Used externally
Chiratæ Conc.	Chiretta in powder 10 ozs., alcohol (20 p.c.) 25 ozs., to 1 pt.; by percolation	1 in 2	½ to 1 dr.
Cuspariæ Conc.	Cusparia bark in powder 10 ozs. and alcohol (20 p.c.) 25 ozs.; by percolation	1 in 2	½ to 1 dr.
Epispasticus (<i>Blistering Liquid</i>)	Cantharides in powder 10 ozs., acetic ether <i>q.s.</i> to 1 pt.; by percolation	1 in 2 It is twice the strength of B. P. 1885	Used externally
Ethyl Nitritus Ferri Acetatis	— Solution of ferric sulphate 2½ ozs., solution of ammonia 4 ozs., or <i>q.s.</i> glacial acetic acid (liquefied) 1½ ozs. and water <i>q.s.</i> to 1 pt.; by solution, &c.	2½ to 3 p.c. 10 p.c. (almost)	20 to 60 ms. 5 to 15 ms.

Liquor	Composition	Strength	Dose
Ferri Perchloridi	Strong solution of ferric chloride 5 ozs., and water to 1 pt. ; by mixture	1 in 4	5 to 15 ms.
Ferri Perchloridi Fortis	Iron 4 ozs., hydrochloric acid 20½ ozs., nitric acid 1½ ozs., and water <i>q.s.</i> to 17½ ozs.	22½ grs. of iron in 110 ms.	—
Ferri Pernitratis	Iron 1 oz., nitric acid 4½ ozs., and water <i>q.s.</i> to 30 ozs. ; by solution and filtration	3¼ grs. of iron in 110 ms.	5 to 15 ms.
Ferri Persulphatis	Ferrous sulphate 8 ozs., sulphuric acid 6 drs., nitric acid 6 drs., and water <i>q.s.</i> to 11 ozs.	36 p.c.	—
Hamamelidis	Fresh leaves 50 ozs., water 100 ozs., and alcohol (90 p.c.) 10 ozs. ; by maceration and distillation to one-half	1 in 1	Used externally
Hydrargyri Nitratis Acidus	Mercury 4 ozs., nitric acid 5 ozs., water 1½ ozs. ; by solution by heat	48 p.c.	Used externally
Hydrargyri Perchloridi	Mercuric chloride 10 grs., and water 1 pt. ; by solution	¼ gr. in 1 dr. or ½ gr. in 1 oz.	½ to 1 dr.
Hydrogenii Peroxidi	An aqueous solution of hydrogen peroxide	10 of oxygen in 1	½ to 2 drs.
Iodi Fortis	Iodine 1½ ozs., potassium iodide ¾ oz., water 1½ ozs., and alcohol (90 p.c.) 9 ozs., by solution	1 in 9	Used externally
Krameriae Conc.	Krameria root in powder 10 ozs., alcohol (20 p.c.) 25 ozs. ; by percolation	1 in 2	½ to 1 dr.
Magnesii Carbonatis	Magnesium sulphate 2 ozs., sodium carbonate 2½ ozs., and water <i>q.s.</i> to 1 pt.	10 grs. in 1 oz. (nearly)	1 to 2 ozs.
Morphineæ Acetatis	Morphine acetate 17½ grs., diluted acetic acid 38 ms., alcohol (90 p.c.) 1 oz. and water <i>q.s.</i> to 4 ozs. ; by solution	1 gr. in 110 ms.	10 to 60 ms.
Morphineæ Hydrochloridi	Morphine hydrochloride 17½ grs., diluted hydrochloric acid 38 ms., alcohol (90 p.c.) 1 oz., and water <i>q.s.</i> to 4 ozs.	1 gr. in 110 ms.	10 to 60 ms.

Laquer	Composition	Strength	Dose
Morphinæ Tartratis	Morphine tartrate 17½ grs., alcohol (90 p c) 1 oz., and water q.s. to 4 ozs.	1 gr. in 110 ms.	10 to 60 ms.
Pancreatis	A liquid preparation containing the digestive principles of fresh pancreas of the pig	1 in 4 (nearly)	1 to 2 drs. (<i>unofficial</i>)
Picis Carbonis	Prepared coal tar 4 ozs., quillina bark in powder 2 ozs., and alcohol (90 p c.) q.s. to 1 pt., by percolation and digestion	1 in 6	Used externally
Plumbi Subacetatis Dil. (<i>Goulard's Lotion</i>)	Strong lead subacetate solution 2 drs., alcohol (20 p c) 2 drs., water q.s. to 1 pt.	1 in 80	Used externally
Plumbi Subacetatis Fortis (<i>Goulard's Extract</i>)	Lead acetate 5 ozs., lead oxide in powder 3½ ozs., and water q.s. to 1 pt.; by boiling	24 p c.	Used externally
Potassæ	An aqueous solution containing 27 grs. of potassium hydroxide in 1 oz.	6½ grs. in 110 ms.	10 to 30 ms.
Potassii Permanganatis	Potassium permanganate 87½ grs., and water q.s. to 1 pt.; by solution	1 gr. in 110 ms.	2 to 4 drs.
Quassia Conc.	Quassia wood powdered 2 ozs., and alcohol (20 p c) q.s. to 1 pt.; by percolation	1 in 10	½ to 1 dr.
Rhei Conc.	Rhubarb root powdered 10 ozs. and alcohol (20 p c) q.s. to 1 pt., by percolation	1 in 2	½ to 1 dr.
Sarsæ Co. Conc.	Sarsaparilla cut and bruised 20 ozs., sassaparilla root shavings 2 ozs., guaiacum wood shavings 2 ozs., dried liquorice root bruised 2 ozs., mezereon bark cut small 1 oz., alcohol (90 p c.) 4½ ozs., and water q.s. to 1 pt., by infusion and decoction	1 in 1	2 to 8 drs.
Senegæ Conc.	Senega root 10 ozs., a mixture of 2 parts of alcohol (20 p c) and one part of alcohol (15 p c) 25 ozs. or q.s. to 1 pt., by percolation	1 in 2	½ to 1 dr.

Liquor	Composition	Strength	Dose
Sennæ Con.	Senna powder 20 ozs., tincture of ginger $2\frac{1}{2}$ ozs., alcohol (90 p.c.) 2 ozs., and water <i>q. s.</i> to 1 pt.	1 in 1	$\frac{1}{2}$ to 1 dr.
Serpentariæ Con.	Rhizome powdered 10 ozs. and alcohol (20 p.c.) 25 ozs. or <i>q. s.</i> to 1 pt.; by percolation	1 in 1	$\frac{1}{2}$ to 2 dr.
Sodæ Chlorinatæ	Chlorinated lime 16 ozs., sodium carbonate 24 ozs., and water 1 gal.; by solution with trituration, and filtration	$2\frac{1}{2}$ p.c. (1.	10 to 20 ms.
Sodii Arsenatis	Sodium Arsenate recently rendered anhydrous $17\frac{1}{2}$ grs., and water <i>q. s.</i> to 4 ozs.; by solution	1 in 110 ms.	2 to 8 ms.
Sodii Ethylatis	Clean and bright sodium 22 grs. and absolute alcohol 1 oz.; cautiously dissolved	18 p.c. C_2H_5ONa	Used externally
Strychninæ Hydrochloridi	Strychnine hydrochloride $17\frac{1}{2}$ grs., alcohol (90 p.c.) 1 oz., and water <i>q. s.</i> to 4 ozs.; by solution	1 gr. in 110 ms.	2 to 8 ms.
Thyroidei	A liquid prepared from fresh and healthy thyroid gland of the sheep	100 ms. = 1 gland	5 to 15 ms.
Trinitrini	Trinitroglycerin of com- merce $17\frac{1}{2}$ grs., alcohol (90 p.c.) <i>q. s.</i> to 4 ozs.	1 gr. in 110 ms.	$\frac{1}{2}$ to 2 ms.
Zinci Chloridi	Granulated zinc 1 lb., hydrochloric acid 44 ozs., and water <i>q. s.</i> to 2 pt.	46 grs. in 1 dr.	Used externally

The following eleven are of the same strength, containing 1 grain in 110 minims:—

Liq. Arsenicalis	Liq. Morphinæ Tart.
„ Arsenici Hydrochlor.	„ Pot. Permanganatis
„ Arseni et Hydrarg. Iodidi	„ Sodii Arsenatis
„ Atropinæ Sulph.	„ Strychninæ Hydrochlorid.
„ Morphinæ Acetat.	„ Trinitrini
„ Morphinæ Hydrochlor.	

Concentrated liquors are newly introduced into the B.P. 1898. Diluted with water, they may be prescribed in place of the corresponding official infusions or decoctions. The concentrated Liquors only differ in minor points from freshly prepared decoctions or infusions, and

contain a small quantity of ethylic alcohol. They are ten in number, viz.—the concentrated solutions of Calumba, Chiretta, Cusparia, Krameria, Quassia, Rhubarb, Sarsaparilla, Senega, Senna and Serpentry. Liq. Sarsæ Comp. Conc. is substitute for the old preparation of Decoct. Sarsæ Comp.

Lotiones. Lotions are solutions or mixtures of active ingredients for external application only. They are two in number :—

Lotio	Composition	Strength	Action and use
Hydrarg. Flava (<i>Yellow Wash</i>)	Mercuric chloride 20 grs. and solution of lime 10 ozs. ; by mixture	2 grs. in 1 oz. (Mercuric oxide precipitates)	A stimulating application to syphilitic sores, especially where black wash is not sufficiently powerful
Hydrarg. Nigra (<i>Black Wash</i>)	Mercurous chloride 30 grs., glycerin $\frac{1}{2}$ oz., mucilage of tragacanth $1\frac{1}{2}$ ozs., and solution of lime <i>q.s.</i> to 10 ozs. ; by trituration and mixture	3 grs. in 1 oz.	A stimulating alterative application to syphilitic sores

Mella. Mellita. Honeys are liquid preparations containing mostly honey as a vehicle. They are four in number :—

Mel Depuratum is honey melted and strained through flannel.

Mel	Preparation	Strength	Dose	Action
Boracis	Powdered borax 1 oz., clarified honey 8 ozs., and glycerin $\frac{1}{2}$ oz. ; by mixture	1 in 9 $\frac{1}{2}$	Used locally	An alterative to diseased mucous surface
Oxymel	Clarified honey liquefied 40 ozs., acetic acid 3 ozs., and water <i>q.s.</i> or about 5 ozs. ; by mixture	4 in 5	1 to 2 drs.	Expectorant. Used as a vehicle
Oxymel Scillæ	Squill bruised 2 $\frac{1}{2}$ ozs., acetic acid 2 $\frac{1}{2}$ ozs., water 8 ozs. ; digest for 7 days and to the product add clarified honey <i>q.s.</i> or 27 ozs. to produce a sp. gr. 1.320	—	$\frac{1}{2}$ to 1 dr.	Expectorant

Misturæ. **Mixtures** are preparations in which drugs are simply dissolved in water or suspended in it. Insoluble substances are usually suspended by the aid of mucilage, syrup, yolk of egg, &c. The official mixtures are only nine in number, the ingredients of which are mostly suspended. Mist. Sennæ Co. is an official substitute for "Black Draught." Egg flip or Brandy mixture is prepared with yolk of egg. The dose is the same for all $\frac{1}{2}$ to 1 or 2 ozs.

Mistura	Preparation	Strength per oz.	Dose	Action
Ammoniæ	Powdered ammoniacum $\frac{1}{2}$ oz., syrup of tolu 4 drs. and water $7\frac{1}{2}$ ozs.; by trituration and straining	$13\frac{1}{2}$ grs.	$\frac{1}{2}$ to 1 oz.	Stimulating expectorant
Amygdalæ	Compound powder of almonds 2 ozs., water 16 ozs.; by trituration and straining	54 grs.	$\frac{1}{2}$ to 1 oz.	Used as a vehicle
Creosoti	Creosote 16 ms., spirit of juniper 16 ms., syrup 1 oz., and water q.s. to 16 ozs.; by shaking	1 m.	$\frac{1}{2}$ to 1 oz.	Sedative, astringent and anti-septic
Cretæ	Prepared chalk $\frac{1}{2}$ oz., tragacanth in powder 15 grs., refined sugar $\frac{1}{2}$ oz., and cinnamon water to 8 ozs.; by trituration	$13\frac{1}{2}$ grs.	$\frac{1}{2}$ to 1 oz.	Antacid and astringent
Ferri Co. (<i>Griffith's Mixture</i>)	Ferrous sulphate 25 grs., potassium carbonate 30 grs., myrrh 60 grs., refined sugar 60 grs., spirit of nutmeg 50 ms., and rose water q.s. to 10 ozs.; by trituration and solution	$2\frac{1}{2}$ grs.	$\frac{1}{2}$ to 1 oz.	Hæmatinic and emmenagogue
Guaiaci	Guaiacum resin $\frac{1}{2}$ oz., refined sugar $\frac{1}{2}$ oz., powdered tragacanth 35 grs., and cinnamon water 1 pt.; by trituration	11 grs.	$\frac{1}{2}$ to 1 oz.	Stimulant, alterative and diaphoretic

Mistura	Preparation	Strength per oz.	Dose	Action
Olei Ricini	Castor oil 3 ozs., mucilage of gum acacia $1\frac{1}{2}$ ozs., undiluted commercial orange flower water 1 oz., and cinnamon water $2\frac{1}{2}$ ozs.; by trituration	3 drs.	1 to 2 ozs. as a draught	Cathartic
Sennæ Co. (<i>Black Draught</i>)	Magnesium sulphate 5 ozs., liquid extract of liquorice 1 oz., tinct. card. co 2 ozs., spt ammon aromat 1 oz., and inf. sennæ <i>q.s.</i> to 1 pt.; by solution	$\frac{1}{4}$ oz. mag. sulph.	1 to 2 ozs. as a draught	Hydragogue cathartic
Spt. Vini Gallici (<i>Egg-flip</i>)	Brandy 4 ozs., cinnamon water 4 ozs., refined sugar $\frac{1}{2}$ oz., and yolks of 2 eggs, by trituration	3 drs.	1 to 2 ozs. as a draught	Nutritive, restorative and stimulant

Mucilagines. **Mucilages** are solutions of gummy substances in water. They are two in number, *viz.*—

Mucilago Acaciæ, prepared by dissolving gum acacia 4 ozs. in distilled water 6 ozs. after rinsing.

Mucilago Tragacanthæ, prepared by dissolving powdered tragacanth 60 grs. in alcohol (90 p.c.) 2 drs., and distilled water to make 10 ozs.

Mucilages are used chiefly as vehicles or excipients with a view to assist suspension of insoluble powders in a mixture, or in pill-making and pill-coating. They have little therapeutical value except as demulcents to inflamed mucous surfaces.

Oleata. **Oleates** are preparations of bases with oleic acid, having a solid or semi-solid consistence. Only one preparation is in the B.P., *viz.*—

Hydrargyri Oleas. Mercuric chloride 1 oz., powdered hard soap 2 ozs., oleic acid 1 dr. and boiling distilled water *q.s.*

Olea. **Oils.**—There are thirty-three oils in the B.P. They can be grouped under two classes—*fixed* and *volatile*. The former being obtained by expression, and the latter by distillation except in the case of Lemon oil which is a volatile oil obtained by expression, and Oleum Phosphoratum, which is a solution of phosphorus in almond oil. Oil of Cade is obtained by dry or destructive distillation.

Of the eight fixed oils, Cod-liver oil is an animal product, being

extracted by heat not exceeding 180° F., and the rest are expressed at ordinary temperatures. Ol. Theobrom. is solid in cold weather and semi-solid or fluid in hot weather. The colour of Cajuputi is deep-green and that of Cade is almost black. Ol. Terebinthina is almost colourless. The rest display various shades of straw, yellow and pale-brown. The doses of **Croton oil** and **Phosphorated oil** are $\frac{1}{2}$ to 1 m. and 1 to 5 ms. respectively; while the remaining can be given in large doses.

FIXED OR EXPRESSED OILS

Oleum	Source	Dose	Action
Amygdalæ .	Bitter or sweet almonds	Used externally	Demulcent and emollient
Crotonis .	Seeds	$\frac{1}{2}$ to 1 m.	Hydragogue purgative
Lini . .	Linseed	Used externally	Demulcent, emollient
Morrhue .	Fresh liver; extracted by heat under 180° F.	1 to 4 drs	Nutritive, tonic and alterative
Olivæ . .	Ripe fruit	2 drs. to 1 oz.	Laixative
Phosphoratum	Oil of almonds and phosphorus	1 to 5 ms.	Tonic and alterative
Ricini . .	Fresh seeds	1 to 8 drs.	Cathartic
Theobromacæ	Washed seeds; expressed by heat	Used externally	For making all suppositories except that of Glycerin

VOLATILE, ESSENTIAL OR DISTILLED OILS

Oleum	Source	Dose	Action
Anethi .	Dill fruit	$\frac{1}{2}$ to 3 ms.	Antispasmodic and carminative
Anisi . .	Anise or star-anise fruits	$\frac{1}{2}$ to 3 ms	Do.
Anthemidis .	Chamomile flowers	$\frac{1}{2}$ to 3 ms.	Aromatic, stimulant
Cadinum (<i>Juniper Tar Oil</i>)	Woody portions; by destructive distillation	Used externally	A stimulating application to scaly cutaneous diseases
Cajuputi .	Leaves	$\frac{1}{2}$ to 3 ms.	A diffusible stimulant and antispasmodic

Oleum	Source	Dose	Action
Carui . .	Caraway fruit	$\frac{1}{2}$ to 3 ms.	Carminative, anti-spasmodic
Caryophylli .	Cloves	$\frac{1}{2}$ to 3 ms.	Do.
Cinnamomi .	Cinnamon bark	$\frac{1}{2}$ to 3 ms.	Carminative, stomachic
Copaibæ .	Copaiba	5 to 20 ms.	A stimulant to urinary and other mucous membranes
Coriandri .	Coriander fruit	$\frac{1}{2}$ to 3 ms.	Antispasmodic, carminative
Cubebæ .	Cubebæ	5 to 20 ms.	Diuretic, expectorant
Eucalypti .	Fresh leaves	$\frac{1}{2}$ to 3 ms.	Antiseptic
Juniperi .	Unripe green fruit	$\frac{1}{2}$ to 3 ms.	Stimulant, diuretic
Lavandulæ .	Flowers	$\frac{1}{2}$ to 3 ms.	Carminative, anti-spasmodic
Limonis .	Fresh lemon peel	$\frac{1}{2}$ to 3 ms.	Aromatic
Menthæ .	Fresh flowering plant	$\frac{1}{2}$ to 3 ms.	Antispasmodic and carminative
Piperitæ .	Fresh flowering plant	$\frac{1}{2}$ to 3 ms.	Do.
Menthæ Viridis .	Fresh flowering plant	$\frac{1}{2}$ to 3 ms.	Do.
Myristicæ .	Dried seeds	$\frac{1}{2}$ to 3 ms.	Carminative and narcotic
Pimentæ .	Unripe fruits	$\frac{1}{2}$ to 3 ms.	Stimulant, carminative
Pini . .	Fresh leaves	Used externally	Rubefacient and astringent
Rosæ . .	Fresh flowers	—	Powerful fragrant
(<i>Oil of Rose</i>)			
Rosmarini .	Flowering tops	$\frac{1}{2}$ to 3 ms.	Rubefacient and stimulant
Santali .	Wood of <i>Santalum album</i>	5 to 30 ms.	Diuretic and stimulant like copaiba
Sinapis Volatile .	Black mustard seeds	—	Vesicant
Terebinthinæ .	From oleo-resin by aid of steam	2 to 10 ms. As an anthelmintic 3 to 4 drs.	Rubefacient, diuretic, anthelmintic and cathartic

The oils of Cloves, Cinnamon, Pimento and Mustard *sink* in water. The dose of most of the volatile oils is from $\frac{1}{2}$ to 3 minims, with the exception of Copaiba, Cubebæ, Sandal-wood and Turpentine. The oil of Mustard, as now ordered in the B.P., is a volatile oil and is a

powerful irritant poison, and is only used externally in the shape of Lint. Smapis. Volatile oils are combined with many B.P. pills either as carminatives or to serve as a means of distinction between various pill masses of similar appearance.

Pilulæ. Pills are solid or semisolid globular masses containing medicinal agents intended to be swallowed whole without chewing. Pills are always popular for easy administration, being portable, easily swallowed and containing a definite and correct dose. They should not be too hard unless intended to dissolve slowly, or so soft as to lose shape and stick together. To prevent this and to cover the nauseous taste they are coated or gilded. In India and tropical countries, pills get too hard or too soft according to the variations of the weather; being liable to become soft and run together during the rains. To avoid this, they should be kept in well stoppered bottles. Pills, as a rule, should not weigh more than 5 grains each. A mass of the consistency of firm clay is first made by pounding and kneading the medicines together in a mortar; and subsequently this mass is either rolled and divided by a pill-making machine, or when the quantity is small, the same process is done over a pillule by the spatula. The pills should be perfectly round and firm. An excipient is always necessary to make a pill-mass.

The B.P. pills are twenty-three in number. They are :—

Pilula	Composition	Strength	Dose	Action
Aloes Barb.	Barbados aloes 2 ozs., hard soap 1 oz., oil of caraway 1 dr., and confection of roses 1 oz., or <i>q.s.</i>	1 in 2	4 to 8 grs.	Cathartic
Aloes et asafetidæ	Socotrine aloes 1 oz., asafetida 1 oz., hard soap 1 oz., and confection of roses 1 oz. or <i>q.s.</i>	1 in 4	4 to 8 grs.	Cathartic and anti-spasmodic
Aloes et Ferri	Exsiccated ferrous sulphate 1 oz., Barbados aloes 2 ozs., compound powder of cinnamon 3 ozs., syrup of glucose 3 ozs., or <i>q.s.</i>	2 & 1 in 9	4 to 8 grs.	Cathartic and emmenagogue
Aloes et Myrrhæ	Socotrine aloes 2 ozs., myrrh 1 oz., syrup of glucose 1½ oz. or <i>q.s.</i>	2 & 1 in 4½	4 to 8 grs.	Do.
Aloes Soc.	Aloes Soc. 2 ozs., hard soap 1 oz., oil of nutmeg 1 dr. and conf. of roses 1 oz. or <i>q.s.</i>	1 in 2	4 to 8 grs.	Cathartic

Pilula	Composition	Strength	Dose	Action
Cambogiæ Co.	Camboge 1 oz., Barbados aloes 1 oz., pulv. cinnamon co. 1 oz., hard soap 2 ozs. and syrup of glucose 1 oz. or <i>q.s.</i>	1 in 6	4 to 8 grs.	Hydragogue purgative
Colocynth. Co.	Colocynth pulp 1 oz., Barbados aloes 2 ozs., scammony resin 2 ozs., pot. sulph $\frac{1}{2}$ oz., oil of cloves 2 drs. and water <i>q.s.</i>	1 in 6	4 to 8 grs.	Cathartic
Colocynth. et Hyos.	Pil. colocynth. co. 2 ozs., and extract of hyoseyam 1 oz.	2 & 1 in 3	4 to 8 grs.	Cathartic
Ferri (Substitute for <i>Blaud's Pill</i>)	Exsiccated ferrous sulphate 150 grs., exsiccated sodium carbonate 95 grs., gum acacia 50 grs., tragacanth 15 grs., syrup 150 grs., glycerin 10 grs., and water 20 grs. or <i>q.s.</i>	1 in 5 (Ferrous Carb.)	5 to 15 grs.	Tonic and emmenagogue
Galbani Co.	Asafetida 2 ozs., galbanum 2 ozs., myrrh 2 ozs., and syrup of glucose 1 oz. or <i>q.s.</i>	1 in 3 $\frac{1}{2}$	4 to 8 grs.	Antispasmodic in hysteria
Hydrargyri (<i>Blue Pill</i>)	Mercury 2 ozs., confect. of roses 3 ozs., liquorice root powdered 1 oz.	1 in 3	4 to 8 grs.	Alterative and laxative
Hydrargyri Subchlor. Co. (<i>Plummer's Pill</i>)	Mercurous chloride 1 oz., sulphurated antimony 1 oz., guaiacum resin 2 ozs., castor oil 180 grs., and alcohol (90 p.c.) 1 dr. or <i>q.s.</i>	1 in 4 $\frac{1}{2}$	4 to 8 grs.	Alterative and a feeble cathartic
Ipecacuanhæ c. Scilla	Compound powder of ipecac. 3 ozs., squill 1 oz., ammoniacum 1 oz., syrup of glucose <i>q.s.</i>	1 in 20	4 to 8 grs.	Expectorant and narcotic
Phosphori	Phosphorus 10 grs., white beeswax 125 grs., lard 125 grs., kaolin 115 grs., and carbon bisulphide 33 ms. or <i>q.s.</i>	1 in 50	1 to 2 grs.	Tonic and restorative
Plumbic Opio	Lead acetate 36 grs., opium 6 grs., syrup of glucose 4 grs. or <i>q.s.</i>	6 & 1 in 8	2 to 4 grs.	Astringent and narcotic

Pilula	Composition	Strength	Dose	Action
Quininæ Sulphatis	Quinine sulphate 30 grs., tartaric acid 1 gr., glycerin 4 grs., tragacanth 1 gr.	5 in 6	2 to 8 grs.	Tonic and antiperiodic
Rhei Co.	Rhubarb root 3 ozs., Socotrine aloes 2½ ozs., myrrh 1½ ozs., hard soap 1½ ozs., oil of peppermint 1½ drs., syrup of glucose 2¾ ozs. or <i>q.s.</i>	1 in 3½	4 to 8 grs.	Stomachic, tonic and a gentle cathartic
Saponis Co.	Opium ½ oz., hard soap 1½ ozs., syrup of glucose ½ oz.	1 in 5 (of opium)	2 to 4 grs.	Astringent, narcotic; like opium
Scammonii Co.	Scammony resin 1 oz., jalap resin 1 oz., curd soap 1 oz., tincture of ginger 3 ozs.	1 in 3½	4 to 8 grs.	Cathartic
Scillæ Co.	Squill 1½ ozs., ginger 1 oz., ammomaicum 1 oz., hard soap 1 oz., and syrup of glucose 1 oz. or <i>q.s.</i>	1 in 4½	4 to 8 grs.	Expectorant and diuretic

All the cathartic pills in the above table contain Aloes except the Mercurial pills and Pil. Scammonii Co. All pills are given in 4 to 8 grain doses, except Pil. Phosph., Pil. Plumbi c. Opio, Pil. Saponis Co. and Pil. Ferri (which see).

The colour of the B.P. pill-masses is blackish-brown or black, with the exception of Pil. Quin. Sulph. which is *white*; Pil. Hydrarg., which is *blue*, and Pil. Hyd. Subchlor. Co., which is *orange-red*. Camboge pill is not yellow though the drug itself is. Many of the pills can be diagnosed by their smell, for instance, Pil. Rhei Co. by the smell of peppermint; Pil. Saponis by that of opium; and Pil. Aloes et Asafetida by that of asafetida.

The student should familiarize himself with the colour and smell of the above preparations.

Pulveres. Powders are mixtures of dry substances reduced to a fine powder and intimately mixed together. Powders should be mixed in a very clean mortar (a glass one being the best). The method of mixing greatly affects the miscibility of powders. It is the practice of many mothers to administer powders to their children mixed with jam, but it should be borne in mind that the acid present in the jam will combine with and alter the action of any alkalis that may be present. The best and simplest method is to give them mixed with sugar and water, or milk.

The B.P. powders are sixteen in number, and they are as under :—

Pulvis	Composition	Strength	Dose in grains	Action
Amygdalæ Co.	Sweet almonds 8 ozs., refined sugar 4 ozs., and powdered gum acacia 1 oz.	8 in 13	60 to 120	Demulcent, nutritive
Antimonialis (Substitute for <i>James's Powder</i>)	Antimonious oxide 1 oz. and calcium phosphate 2 ozs.	1 in 3	3 to 6	Diaphoretic, emetic in large doses
Catechu Co.	Catechu 4 ozs., kino 2 ozs., krameria root 2 ozs., cinnamon bark 1 oz., and nutmeg 1 oz.	1 in 2½	10 to 40	Aromatic and astringent
Cinnamomi Co.	Cinnamon bark 1 oz., cardamom seeds 1 oz., and ginger 1 oz.	1 in 3	10 to 40	Aromatic, carminative
Cretæ Aromaticus	Cinnamon bark 4 ozs., nutmeg 3 ozs., cloves 1½ ozs., cardamom seeds 1 oz., refined sugar 25 ozs., and prepared chalk 11 ozs.	1 in 4	10 to 60	Aromatic, astringent, and antacid
Cretæ Aromat. cum Opio	Aromatic chalk powder 9½ ozs., and opium ½ oz.	1 in 40 (opium)	10 to 40	Aromatic, astringent, and narcotic
Elaterini Co.	Elaterin 5 grs. and milk-sugar 195 grs.	1 in 40	1 to 4	hydragogue, purgative
Glycyrrhizæ Co.	Senna 2 ozs., liquorice root 2 ozs., fennel fruit 1 oz., sublimed sulphur 1 oz. and sugar 6 ozs.	1 in 6	60 to 120	A mild cathartic
Ipecac. Co. (<i>Dover's Powder</i>)	Ipecac. root ½ oz., opium powder ½ oz. and potassium sulphate 4 ozs.	1 in 10	5 to 15	Diaphoretic, anodyne
Jalapæ Co.	Jalap 5 ozs., acid potassium tartrate 9 ozs. and ginger 1 oz.	1 in 3	20 to 60	Hydragogue purgative
Kino Co.	Kino 3¼ ozs., opium ¼ oz. and cinnamon bark 1 oz.	1 in 20 (opium)	5 to 20	Astringent, anodyne and narcotic
Opii Co.	Opium powder 1½ ozs., black pepper 2 ozs., ginger 5 ozs., caraway 6 ozs., tragacanth ½ oz.	1 in 10	2 to 10	Carminative and narcotic
Rhei Co. (<i>Gregory's Powder</i>)	Rhubarb root 2 ozs., light magnesia 6 ozs., and ginger 1 oz.	1 in 4½	20 to 60	Antacid, stomachic and cathartic.

Pulvis	Composition	Strength	Dose in grains	Action
Scammonii Co.	Scammony resin 4 ozs., jalap 3 ozs., and ginger 1 oz.	1 in 2	10 to 20	Hydragogue purgative
Sodæ Tart. Efferves. (Seidlitz Powder)	Tartarated soda 120 grs., sodium bicarbonate 40 grs., mix, and wrap in blue paper; tartaric acid in dry powder 38 grs., wrap in white paper	120, 40 and 38	198	Hydragogue cathartic
Tragacanth Co.	Tragacanth 1 oz., gum acacia 1 oz., starch 1 oz., and sugar 3 ozs	1 in 6	20 to 60	Demulcent

With the exception of Pulv. Antimonialis, Cretæ Aromat., Cretæ Aromat. c. Opio, and Sodæ Tart. Effervescent, all powders are called "Compound." In fact, all of them are compound, having more than one ingredient. With a little care and trouble they can generally be distinguished by their colour and smell.

Spiritus. Spirits.—A spirit, as ordinarily understood, is a distilled product obtained from fermented vinous liquors. But the B.P. Spirits, with the exception of rectified spirit, are alcoholic solutions of volatile oils and ethers. They can be divided into two classes **simple** and **compound**. The simple Spirits are solutions of essential oils, ethers and chloroform in alcohol (90 p.c.) which often get turbid when diluted with water. The compound Spirits contain more than one ingredient, and are prepared by distillation. The B.P. Spirits are eighteen in number, of which twelve are simple and six compound.

SIMPLE SPIRITS

Spiritus	Composition	Strength	Dose	Action
Ætheris	Ether 10 ozs. and alcohol (90 p.c.) 1 pt.	1 in 3	20 to 40 m. or 60 to 90 m.	A diffusible stimulant, anti-spasmodic and carminative
Anisi	Oil of anise 1 oz. and alcohol (90 p.c.) q.s. to 10 ozs.	1 in 10	5 to 20 m	Carminative and anti-spasmodic
Cajuputi	Oil of cajuput 1 oz. and alcohol (90 p.c.) q.s. to 10 ozs	1 in 10	5 to 20 m	A diffusible stimulant and anti-spasmodic

PHARMACOPŒIAL PREPARATIONS

Spiritus	Composition	Strength	Dose	Action
Camphoræ .	Camphor 1 oz. and alcohol (90 p.c.) <i>q.s.</i> to 10 ozs.	1 in 10	5 to 20 m.	Stimulant and antispasmodic
Chloroformi (<i>Chloric Ether</i>)	Chloroform 1 oz. and alcohol (90 p.c.) <i>q.s.</i> to 1 pt.	1 in 20	5 to 20 m. or 30 to 40 m.	A diffusible stimulant and antispasmodic
Cinnamomi .	Oil of cinnamon 1 oz. and alcohol (90 p.c.) <i>q.s.</i> to 10 ozs.	1 in 10	5 to 20 m.	Carminative and stomachic
Juniperi .	Oil of juniper 1 oz. and alcohol (90 p.c.) <i>q.s.</i> to 1 pt.	1 in 20	20 to 60 m.	A stimulating diuretic
Lavandulæ .	Oil of lavender 1 oz. and alcohol (90 p.c.) <i>q.s.</i> to 10 ozs.	1 in 10	5 to 20 m.	Carminative and antispasmodic
Menthæ pip.	Oil of peppermint 1 oz. and alcohol (90 p.c.) <i>q.s.</i> to 10 ozs.	1 in 10	Do.	Carminative and antispasmodic
Myristicæ .	Oil of nutmeg 1 oz. and alcohol (90 p.c.) <i>q.s.</i> to 10 ozs.	1 in 10	5 to 20 m.	Carminative
Rectificatus	Alcohol with 10 p.c. of water	90 p.c.	—	Same as alcohol
Rosmarini .	Oil of rosemary 1 oz. and alcohol (90 p.c.) <i>q.s.</i> to 10 ozs.	1 in 10		A local and general stimulant

COMPOUND SPIRITS

Spiritus	Composition	Strength	Dose	Action
Ætheris Co. (<i>Hoffmann's Anodyne</i>)	Ether 5½ ozs., alcohol (90 p.c.) 78 ozs., sulphuric acid 36 ozs., distilled water 1½ ozs., and sodium bicarbonate <i>q.s.</i>	s.g. 808 to 812	20 to 40 m. or 60 to 90 m.	A diffusible stimulant and anodyne
Æther. Nitrosi (<i>Secret Spirit of Nitric</i>)	Nitric acid 3 ozs., sulphuric acid 2 ozs., copper 2 ozs., and alcohol (90 p.c.) <i>q.s.</i>	s.g. 838 to 842	20 to 40 m. or 60 to 90 m.	Diaphoretic, diuretic, stimulant, antispasmodic

Spiritus	Composition	Strength	Dose	Action
Ammonise aromat. (<i>Spirit of Sal Volatile</i>)	Carbonate of ammonia 4 ozs., strong solution of ammonia 8 ozs., oil of nutmeg 4½ drs., oil of lemon 6½ drs., alcohol (90 p.c.) 6 pts., and distilled water 3 pts.	1 in 40 (carbonate) 1 in 20 (Liq. ammonia fort.)	20 to 40 m. or 60 to 90 m.	Cardiac stimulant, anti-spas- modic and emmenagogue
Ammonise Fetidus	Asafetida 1½ ozs., strong solution of ammonia 2 ozs., alcohol (90 p.c.) q.s. to 1 pt.	1½ in 20	Do.	Stimulant and anti- spasmodic
Armoracise Co.	Horseradish root 5 ozs., bitter-orange peel 5 ozs., nutmeg 55 grs., alcohol (90 p.c.) 1½ pts., and distilled water 1½ pts.	1 in 8	1 to 2 drs.	Stimulant, diuretic
Vini Gallici (Brandy)	Spirit distilled from wine and matured by age	43½ p.c. ethyl hydroxide	-	Same as alcohol

Succi. Juices.—In making these preparations, the juice is first expressed from the fresh plant; one-third of its volume of alcohol (90%) is then added as a preservative, and it is set aside for seven days before filtration and use. Succus Limonis, properly speaking, cannot be called a preparation, and contains no alcohol. It is used for making lemon syrup. The B.P. juices are six in number including Succus Limonis:—

Succus	Source	Dose	Action
Belladonnæ	Fresh leaves and young branches	5 to 15 ms.	Anodyne and sedative
Conii	Fresh leaves and young branches	1 to 2 drs.	Do.
Hyoscyami	Fresh leaves, flowering tops and young branches	½ to 1 dr.	Do.
Scoparii	Fresh broom tops	1 to 2 drs.	Diuretic
Taraxaci	Fresh root	1 to 2 drs.	Diuretic, feeble cholagogue and laxative

Suppositoria. Suppositories are solid conical shaped masses containing some active ingredients, for rectal medication. With the exception of the glycerin suppository, all of them are blended with

cacao-butter which melts at 95° F. They consequently dissolve slowly as soon as they are introduced into the rectum. They weigh about 15 grains each and are made in conical moulds of massive gun-metal. They are seven in number. --

Suppositoria	Composition	Strength in each	Action
Acidi Carbolicæ	Phenol 12 gr., beeswax 24 grs., oil of theobroma q.s. for 12	1 gr.	Antiseptic and a local anæsthetic
Acidi Tannici	Tannic acid 36 grs., oil of theobroma q.s. for 12	3 grs.	A local astringent and styptic
Belladonnæ	Alcoholic extract of belladonna 18 grs. and oil of theobroma q.s. for 12	15 gr. each or $\frac{1}{16}$ gr. (alkaloids)	A local anodyne
Glycerini	Gelatin $\frac{1}{2}$ oz., glycerum 2½ ozs., and distilled water q.s.	70 p.c.	Introduced into the rectum in constiveness.
Iodoformi	Iodoform 36 grs. and oil of theobroma q.s. for 12	3 grs.	A local antiseptic
Morphinæ	Morphine hydrochloride 3 grs. and oil of theobroma q.s. for 12	1 gr.	A local anodyne
Plumbi Co.	Lead acetate 36 grs. and opium 12 grs., and oil of theobroma q.s. for 12	3 grs. and 1 gr.	Anodyne and astringent

There is an unofficial cocaine suppository which is made hollow to go on the end of the finger. This is intended to be introduced into the cervix uteri during the first stage of labour for the purpose of lessening the pains.

Each Glycerin Suppository, the base of which is gelatin, is made to weigh either 30, 60, or 120 grs. It opens the bowels by inducing reflex action. Suppositoria Plumbi Co. contain 1 grain of opium, though the name does not indicate it.

Suppositories are used either to produce a local action on the rectum, or on the adjacent pelvic organs such as the uterus and the bladder, or when we wish to produce their general effect on the system without upsetting the stomach. Thus, Morphine suppository may be used either to soothe pain and irritation in the rectum or pelvic organs, or to induce sleep. The compound lead suppository acts in a similar manner.

Syrupi. Syrups are fluid preparations of drugs containing a sufficient quantity of refined sugar, either to preserve them or to make their administration more agreeable. In the case of Syr. Ferri Iodidi

and Syr. Ferri Phosph. sugar prevents oxidation. They are twenty-two in number :—

Syrupus	Composition	Strength by volume	Dose in drachm	Action
Syrupus	Refined sugar 5 lbs. and boiling water <i>q.s.</i> to 7½ lbs.	1 in 1½	—	A sweetening agent
Aromaticus	Tincture of orange 5 ozs., cinnamon water 5 ozs., and syrup 10 ozs.	—	½ to 1	A flavouring agent
Aurantii	Syrup 7 ozs. and tincture of orange 1 oz	1 in 8	½ to 1	A flavouring agent
Aurantii Floris	Commercial orange flower water 8 ozs., sugar 3 lbs., and boiling water <i>q.s.</i> to 4½ lbs	1 in 6½	½ to 1	A flavouring agent
Calci Lacto-phosph.	Precipitated calcium carbonate 2½ ozs., concentrated phosphoric acid 4 ozs. and 262 mss., lactic acid 6 ozs., sugar 70 ozs., commercial orange flower water 2½ ozs., and water <i>q.s.</i> to 5 pts.	—	½ to 1	Nervine tonic
Cascarae Aromaticus	Liquid extract of cascara 8 ozs., tincture of orange 2 ozs., alcohol (90 p.c.) 1 oz., cinnamon water 3 ozs., and syrup 6 ozs.	1 in 2½	½ to 2	Stomachic, tonic and laxative
Chloral	Chloral hydrate 1600 grs., water 30 drs., and syrup <i>q.s.</i> to 1 pt.	1 in 6 or 10 grs. in 1 dr.	½ to 2	Hypnotic
Codeinæ	Codeine phosphate 40 grs., water ½ oz., and syrup 19½ ozs.	1 in 240 or ½ gr. in 1 dr.	½ to 2	Hypnotic
Ferri Iodidi	Iron wire ½ oz., iodine 726 grs., sugar 16½ ozs., and water <i>q.s.</i> to 1 pt.	1 in 11	½ to 1	Hæmatomic, tonic and alterative
Ferri Phosphatis	Iron wire 75 grs., concentrated phosphoric acid 1½ ozs., syrup 14 ozs., and water <i>q.s.</i> to 1 pt.	1 in 60 or 1 gr. of ferrous phosphate in 1 dr.	½ to 1	Hæmatomic, nerve tonic
Ferri Phosph. c. Quin. et Strychnina (<i>Easton's Syrup</i>)	Iron wire 75 grs., concentrated phosphoric acid 1½ ozs., strychnine powdered 5 grs., quinine sulphate 130 grs., syrup 14 ozs., and water <i>q.s.</i> to 1 pt.	1 gr. ferrous phosphate, ½ gr. of quin. sulph. and ⅓ gr. of strychnine in 1 dr.	½ to 1	A general and nervine tonic

Syrupus	Composition	Strength by volume	Dose in drachm	Action
Glucosi	Commercial liquid glucose 1 oz., and syrup 2 ozs.	1 in 3	—	An excipient for pills
Hemidesmi	Hemidesmus root 4 ozs., sugar 28 ozs., and boiling water 1 pt.	1 in 8	$\frac{1}{2}$ to 1	Alterative. An adjuvant for cough mixture
Limonis	Sliced fresh lemon peel* 1 oz., alcohol (90 p.c.) <i>q.s.</i> , lemon juice 25 ozs., and sugar 38 ozs.	1 in 2 $\frac{1}{2}$	$\frac{1}{2}$ to 1	A flavouring agent
Pruni Virginianæ	Virginian prune bark 3 ozs., sugar 15 ozs., glycerin 1 $\frac{1}{4}$ ozs., and water <i>q.s.</i> to 1 pt.	1 in 6 $\frac{1}{2}$	$\frac{1}{2}$ to 1	Nervine sedative and a sweetening agent
Rhei	Rhubarb root 2 ozs., coriander fruit 2 ozs., sugar 24 ozs., alcohol (90 p.c.) 8 ozs., and water 24 ozs.	1 in 15	$\frac{1}{2}$ to 2	A mild laxative for children
Rheados	Red poppy petals 13 ozs., sugar 2 $\frac{1}{4}$ lbs., alcohol (90 p.c.) 2 $\frac{1}{2}$ ozs., and water <i>q.s.</i> to 3 lbs. 10 ozs.†	1 in 3 $\frac{1}{2}$	$\frac{1}{2}$ to 1	A colouring agent for mixtures
Rosæ	Dried red-rose petals 2 ozs., sugar 30 ozs., and boiling water 1 pt.	1 in 17 $\frac{1}{2}$	$\frac{1}{2}$ to 1	A bright colouring agent
Scillæ	Vinegar of squill 1 pt. and sugar 38 ozs.	1 pt. in 38 ozs.	$\frac{1}{2}$ to 1	Expectorant in $\frac{1}{2}$ to 1 dr., and emetic in 1 oz.
Sennæ	Senna 40 ozs., oil of coriander 10 ms., alcohol (90 p.c.) 40 ms., sugar 50 ozs., and alcohol (20 p.c.) 70 ozs.	1 in 2	$\frac{1}{2}$ to 2	A mild cathartic
Tolutanus	Balsam of tolu 1 $\frac{1}{4}$ ozs., sugar 2 lbs., and water <i>q.s.</i> to make 3 lbs. by weight	1 in 29	$\frac{1}{2}$ to 1	A sweetening agent for cough mixtures
Zingiberis	Ginger $\frac{1}{2}$ oz., alcohol (90 p.c.), syrup of each <i>q.s.</i> to produce 1 pt.	1 in 40	$\frac{1}{2}$ to 1	Carminative and anti-spasmodic

* When fresh lemon peel cannot be obtained dried lemon peel may be used.

† In India and the Colonies when prevailing high temperatures render this preparation liable to ferment the proportion of alcohol (90 p.c.) may be increased to not more than double the proportion stated in the text of the Pharmacopœia, an equivalent quantity of distilled water being omitted.

If the student will take the trouble to familiarize himself with the colour, smell and taste of the different syrups he will have no difficulty in distinguishing them from one another. Syrups which resemble each other in colour always have either a characteristic smell or taste. He should group them according to the following table of colours, and then smell and taste them until all doubt is removed.

Syr. Aurantii Flor.	} Colourless	Syr Sennae	Dark-brown	
.. Calci Lactophosph.		.. Aurantii	} Straw-coloured	
.. Chloral		.. Aromat.		
.. Codemae		.. Limonis		
.. Ferri Iodidi		.. Scillae		
.. .. Phosph.	.. Zingiberis			
.. Tolutanus	} Brown	.. Rheados	} Red	
.. Cascaria Aromat		.. Rosae		
.. Hemidesmi		Syrup of ginger is somewhat cloudy		
.. Pruni Virginianae		Syrup Ferri Iodidi is very liable to discoloration		
.. Rhei				

Tabellæ. Tablets.—According to the B.P., tablets are small flat pieces of chocolate containing minute doses of medicinal agents. Tablet-preparations are very popular now, but are often useless since when made by compression they may become so hard and insoluble as to be recovered quite undissolved from the faces. According to their mode of preparation, they may be divided into three classes, viz. (1) those made by compression; (2) those made without compression but by moulding, commonly known as tablet-triturations; and (3) those prepared from a chocolate basis, as ordered by the B.P. The manufacture of compressed tablets has of late developed into a special industry in practical pharmacy and is done by special machinery.

Tablets that contain drugs intended only for external use are called "Solubles" to distinguish them from those for internal administration. To prevent mistakes many Solubles are coloured with some harmless aniline dye.

N.B.—The corresponding terms "tablets" and "soloids" refer to the Burroughs Wellcome products and are protected by patent.

There is only one tablet in the B.P., viz.

Tabellæ Trinitrini.—Made of chocolate, each weighing 5 grains and containing $\frac{1}{10}$ gr. of commercial trinitroglycerin. *Dose*, 1 or 2 tablets.

Tincturæ. Tinctures are alcoholic solutions containing all the active ingredients of the drugs of which they are compounded. In this respect they differ from the official spirits which are merely alcoholic solutions of essential oils. They are sixty-seven in number, of these, two are from the animal kingdom, viz. Tr. Cocci and Tr. Cantharidis; two are prepared from inorganic substances, viz. Tr. Ferri and Tr. Iodi; whilst the remaining sixty-three are of vegetable origin. Ten Tinctures are made by plain solution, twenty-eight by maceration and twenty-nine by percolation.

Alcohol of various strengths is used to make sixty-five tinctures, such as alcohol (90 p.c.) in twenty, alcohol (70 p.c.) in fourteen, alcohol

(60 p.c.) in twenty-one, alcohol (45 p.c.) in ten ; whilst water in addition is put in six. The resulting tincture should measure one pint in all, except Belladonna (30 ozs.) and Nux Vom. (12 ozs.).

One tincture is made with Ether, *e.g.*, Tr. Lobel. *Ætheris*, and one with Tincture of Orange-peel, *e.g.*, Tr. Quinina.

Forty-nine Tinctures are "*simple*," having only one ingredient and one solvent. Nine Tinctures are called "*Compound*," having more than one ingredient. Another group of nine Tinctures are not called compound in the B.P., though they contain more than one ingredient and a solvent. They may more appropriately be named "*Complex*."

We shall group the Tinctures under three heads, *viz.* :—(1) **Simple**, (2) **Compound** and (3) **Complex**.

SIMPLE TINCTURES

Tinctura	Ingredients	Degree of concentration	Alcohol p.c. in menstruum	Process	Strength	Dose
Aconiti .	Root 1 oz.	40	70	P.	1 in 20	5 to 15 m. or 2 to 5 m.
Arnicae .	Rhizome 1 oz.	40	70	P.	1 in 20	—
Asafetidae	Gum-resin 4 ozs.	—	70	M.	1 in 5	$\frac{1}{2}$ to 1 dr.
Aurantii	Fresh peel 5 ozs.	—	90	M.	1 in 4	$\frac{1}{2}$ to 1 dr.
Belladonnæ	Liquid extract 2 ozs. (Standardized)	—	60	S.	$\frac{1}{2}$ gr. alkaloids in 110 m.	5 to 15 m.
Buchu .	Leaves 4 ozs.	20	60	P.	1 in 5	$\frac{1}{2}$ to 1 dr.
Calumbæ	Root 2 ozs.	20	60	M.	1 in 10	$\frac{1}{2}$ to 1 dr.
Cannabis Ind.	Extract 1 oz.	—	90	S.	1 in 20	5 to 15 m.
Cantharidis	Cantharides 1 oz.	40	90	M.	1 in 80	5 to 15 m. or 2 to 5 m.
Capsici .	Fruit 1 oz.	20	70	M.	1 in 20	5 to 15 m.
Cascarillæ	Bark 4 ozs.	40	70	P.	1 in 5	$\frac{1}{2}$ to 1 dr.
Chiratae	Chiretta 2 oz.	40	60	P.	1 in 10	$\frac{1}{2}$ to 1 dr.
Cimicifugæ	Rhizome 2 ozs.	40	60	P.	1 in 10	$\frac{1}{2}$ to 1 dr.
Cinchonæ	Red bark 4 ozs. (Standardized)	40	70	P.	1 gr. alkaloids in 110 m.	$\frac{1}{2}$ to 1 dr.
Cinnamomi	Bark 4 ozs.	40	70	P.	1 in 5	$\frac{1}{2}$ to 1 dr.
Cocci	Cochineal 2 ozs.	—	45	M.	1 in 10	5 to 15 m.
Colchici Sem.	Seeds 4 ozs.	30	45	P.	1 in 5	5 to 15 m.
Conii	Fruit 4 ozs.	40	70	P.	1 in 5	$\frac{1}{2}$ to 1 dr.
Crocæ	Saffron 1 oz.	—	60	M.	1 in 20	5 to 15 m.
Cubebæ	Cubebæ 4 ozs.	—	90	P.	1 in 5	$\frac{1}{2}$ to 1 dr.
Digitalis	Leaves 2½ oz.	20	60	P.	1 in 8	5 to 15 m.

Note. M. = Maceration. P. = Percolation. S. = Solution

Tinctura	Ingredients	Degree of com- minution	Alcohol p.c. in menstruum	Process	Strength	Dose
Ferri Perchlor.	Strong solution 5 ozs., alcohol, 5 ozs. and water 7 s.	—	90	S.	1 m 4	5 to 15 m.
Gelsemii	Root 2 ozs.	40	60	P.	1 in 10	5 to 15 m.
Hamamelidis	Bark 2 ozs.	20	45	P.	1 in 10	$\frac{1}{2}$ to 1 dr.
Hydrastis	Rhizome 2 ozs.	60	60	P.	1 m 10	$\frac{1}{2}$ to 1 dr.
Hyoscyami	Leaves and flower- ing tops 2 ozs.	20	45	P.	1 m 10	$\frac{1}{2}$ to 1 dr.
Jaborandi	Leaves 4 ozs.	40	45	P.	1 in 5	$\frac{1}{2}$ to 1 dr.
Jalapæ	Jalap 4 ozs. (Standardized)	40	70	P.	1 $\frac{1}{2}$ gr. resin in 110 m	$\frac{1}{2}$ to 1 dr.
Kramerizæ	Root 4 ozs.	40	60	P.	1 m 5	$\frac{1}{2}$ to 1 dr.
Limonis	Fresh peel 5 ozs.	—	90	M.	1 m 4	$\frac{1}{2}$ to 1 dr.
Lobeliæ	Lobelia 4 ozs., spirit of ether (stronger than B.P. 1885)	40	90	P.	1 in 5	5 to 15 m
Lupuli	Hops 4 ozs.	—	60	M.	1 m 5	$\frac{1}{2}$ to 1 dr.
Myrrhæ	Myrrh 4 ozs.	—	90	M.	1 m 5	$\frac{1}{2}$ to 1 dr.
Nucis Vomiceæ	Liquid extract 2 ozs., water 3 ozs.	—	90	S.	$\frac{1}{2}$ gr. strychnine in 110 m	5 to 15 m
Opii (Laudanum)	Opium 3 ozs., water 7 s. (Standardized)	—	90	M.	$\frac{1}{2}$ gr. morphine in 110 m.	5 to 15 m or 20 to 30 m
Podophylli	Resin 320 grs.	—	90	M.	3- grs. in 110 m.	5 to 15 m
Pruni Virg.	Bark 4 ozs., water 7 l ozs.	20	90	M.	1 m 5	$\frac{1}{2}$ to 1 dr.
Pyrethri	Roots 4 ozs.	40	70	P.	1 m 5	Not taken
Quassizæ	Chips 2 ozs.	—	45	M.	1 m 10	$\frac{1}{2}$ to 1 dr.
Quillaizæ	Bark 1 oz.	20	60	P.	1 m 20	$\frac{1}{2}$ to 1 dr.
Quininzæ	Quinine hydro- chloride 175 grs.	—	90	S.	2 gr. in 110 m.	$\frac{1}{2}$ to 1 dr.
Scillæ	Squill 4 ozs.	—	60	M.	1 m 5	5 to 15 m
Senegæ	Root 4 ozs.	40	60	P.	1 m 5	$\frac{1}{2}$ to 1 dr.
Serpentariæ	Rhizome 4 ozs.	40	70	P.	1 m 5	$\frac{1}{2}$ to 1 dr.
Stramonii	Leaves 4 ozs.	20	45	P.	1 m 5	5 to 15 m
Strophanthi	Seeds $\frac{1}{2}$ oz.	30	70	P.	1 m 10	5 to 15 m
Sumbul	Root 2 ozs.	—	70	M.	1 m 10	$\frac{1}{2}$ to 1 dr.
Tolutana	Balsam 2 ozs.	—	90	M.	1 m 10	$\frac{1}{2}$ to 1 dr.
Zingiberis	Rhizome 2 ozs.	40	90	P.	1 m 10	$\frac{1}{2}$ to 1 dr.

Note. M. = Maceration. P. = Percolation. S. = Solution.

COMPOUND TINCTURES

Tinctura	Ingredients	Alcohol p.c. in men- struum	Strength	Dose
Benzoini Co. (<i>Friar's Balsam</i>)	Benzoin 2 ozs., storax 1½ ozs., tolu ½ oz., So- cotrine aloes 160 grs.	90	1 in 10	½ to 1 dr.
Camphoræ Co. (<i>Largoric</i>)	Tincture of opium 585 ms., benzoic acid 40 grs., camphor 30 grs., oil of anise, 30 ms.	60	¼ gr. opium in 1 dr.	½ to 1 dr.
Cardamomi Co.	Cardamom seeds ¼ oz., caraway fruit ¼ oz., raisins 2 ozs., cinna- mon bark ½ oz., cochineal 55 grs.		1 in 80	½ to 1 dr.
Chloro- formi et Morph. Co. (<i>Substitute for chlorodyn</i>)	Chloroform 1½ ozs., morphine hydro- chloride 87½ grs., diluted hydrocyanic acid 1 oz., tincture of capsicum ½ oz. tincture of Indian hemp 2 ozs., oil of peppermint 14 ms glycerin 5 ozs.		¼ m. chloro- form, ½ m acid hydro- cyan. dil., ¼ gr. morph hydrochlor. in 10 ms	5 to 15 m.
Cinchonæ Co.	Tincture of cinchona 10 ozs., bitter orange peel 1 oz., serpentary ½ oz., cochineal 28 grs., saffron 55 grs.		½ gr alkaloids in 110 ms.	¼ to 1 dr.
Gentianæ Co.	Root 2 ozs., bitter orange peel ¼ oz., cardamom seeds ¼ oz.		1 in 10	½ to 1 dr.
Lavandulæ Co.	Oil of lavender 45 ms., oil of rosemary 5 ms., cinnamon bark 75 grs., nutmeg 75 grs., red sanders wood 150 grs.		1 in 213	½ to 1 dr.
Rhei Co.	Root 2 ozs., carda- mom ¼ oz., coriander ¼ oz., glycerin 2 ozs.	60	10 grs. in 110 m.	½ to 1 dr. or 2 to 4 drs.
Sennæ Co.	Senna 4 ozs., raisins 2 ozs., caraway 1 oz., coriander ½ oz.	45	1 in 5	½ to 1 dr. or 2 to 4 drs.

Note. M. = Maceration. P. = Percolation. S. = Solution.

COMPLEX TINCTURES

Tinctura	Ingredients	Alcohol p.c. in men- struum	Process	Strength	Dose
Aloes	Extract of Barba- dos aloes $\frac{1}{2}$ oz., liquid extract of liquorice 3 ozs.	45	M	1 in 40	$\frac{1}{2}$ to 1 dr. or 1½ to 2 drs.
Catechu	Catechu 1 oz., cinnamon bark 1 oz.	60	M	1 in 5	$\frac{1}{2}$ to 1 dr.
Ergotæ Ammo- niata	Ergot 5 ozs., solu- tion of ammonia 2 ozs.	60	P.	1 in 4	$\frac{1}{2}$ to 1 dr.
Guaiaci Ammo- niata	Resin 4 ozs., oil of nutmeg 30 ms., oil of lemon 20 ms., strong solution of ammonia 1½ ozs.	90	M.	1 in 5	$\frac{1}{2}$ to 1 dr.
Iodi	Iodine $\frac{1}{2}$ oz., potas- sium iodide $\frac{1}{2}$ oz., water $\frac{1}{2}$ oz.	90	S	1 in 40	2 to 5 m.
Kino	Kino 2 ozs., gly- cerin 3 ozs., water 5 ozs.	90	M	1 in 10	$\frac{1}{2}$ to 1 dr.
Opii Ammon. (Scotch Paregoric)	Tincture of opium 3 ozs., benzoic acid 180 grs., oil of anise 1 dr., solution of am- monia 4 ozs.	90	S	5 grs. of opium in 1 oz.	$\frac{1}{2}$ to 1 dr.
Quininæ Ammo- niata	Quinine sulph- ate 175 grs., solution of ammonia 2 ozs.	60	S	2 grs. in 110 ms.	$\frac{1}{2}$ to 1 dr.
Valerianæ Ammo- niata	Rhizome 4 oz., oil of nutmeg 30 ms., oil of lemon 20 ms., solution of am- monia 2 ozs.	60	M	1 in 5	$\frac{1}{2}$ to 1 dr.

Trochisci. **Troches** or **Lozenges** are flat solid tablets composed of a basis and one or more active drugs uniformly divided, for the purpose of slowly melting in the mouth. They are prepared either with a Fruit basis, Rose basis, Simple basis or Tolu basis. The new B.P. has the following for the preparation of these bases:

Note. M. = Maceration. P. = Percolation. S. = Solution.

Fruit basis.—Take 500 times the quantity of the drug ordered for one lozenge; mix it intimately with $15\frac{1}{2}$ ozs. of refined sugar in fine powder and 300 grains of gum acacia in powder. Make the mixture into a paste with $1\frac{1}{4}$ fluid ozs. of mucilage of gum acacia and 2 ozs. of the black-currant paste of commerce previously softened with boiling distilled water. Divide the mass into 500 lozenges and dry them in a hot-air chamber at a moderate temperature.

Rose basis.—This is made in the same way as above, except that it is flavoured with rose-water and 2 ozs. more sugar are added.

Simple basis.—This is made in the same way as the *Rose basis*, except that it has neither rose-water nor black-currant paste.

Tolu basis.—This is made in the same way as above, except that 3 fluid drachms of Balsam of Tolu are added to the mass instead of rose-water or currant paste.

There are seventeen Lozenges in the B.P., and they are:—

Trochiscus	Ingredients	Basis	Strength in each	Action and use
Acidi Benzoici	Benzoic acid	F.	$\frac{1}{2}$ gr.	Antiseptic and expectorant
Acidi Carbolici	Phenol	T.	1 gr.	Antiseptic and a local stimulant
Acidi Tannici .	Tannic acid	F.	$\frac{1}{2}$ gr.	A local astringent
Bismuthi Co. (Known as Antacid Lozenge)	Bismuth oxycarbonate, heavy magnesium carb., precipitated calcium carb.	R.	2 grs. 2 grs. 4 grs.	Antacid
Catechu .	Catechu	S.	1 gr.	A local astringent
Eucalypti Gummi	Eucalyptus gum	F.	1 gr.	A local astringent
Ferri Redacti .	Reduced iron	S.	1 gr.	Hæmatinic tonic
Guaiaci Resinæ	Guaiacum resin	F.	3 grs.	Checks acute tonsillitis
Ipecacuanhæ .	Ipecacuanha root	F.	1 gr.	Expectorant
Krameriz .	Extract of kramera	F.	1 gr.	Astringent
Krameriz et Cocainæ	Extract kramera, cocaine hydrochloride	F.	1 gr. $\frac{1}{2}$ gr.	A local astringent and anæsthetic
Morphinæ	Morphine hydrochloride	T.	$\frac{1}{2}$ gr.	Alays cough
Morphinæ et Ipecacuanhæ	Morphine hydrochloride, ipecac. root	T.	$\frac{1}{2}$ gr. $\frac{1}{2}$ gr.	Alays cough
Potassii Chloratis	Potassium chlorate	R.	3 grs.	Alterative in relaxed throat and aphthous mouth
Santonini .	Santonin	S.	1 gr.	A vermicide for round worms

Note. F. = Fruit. R. = Rose. S. = Simple. T. = Tolu.

Trochiscus	Ingredients	Basis	Strength in each	Action and use
Sodii Bicarbonatis Sulphuris	Sodium bicarbonate	R.	3 grs.	Antacid
	Precipitated sulphur, cream of tartar, sugar, gum acacia, mucilage and tincture of orange	—	5 grs.	A mild laxative

Unguenta. Ointments are semisolid or soft preparations for external application containing some active drugs mixed with a fatty oily or paraffin basis, lard either plain or benzoated, glycerin, oleic acid, spermaceti, almond oil, olive oil, lanoline, prepared suet, bees-wax, &c., either alone or in combination, form the basis of all B.P. ointments.

There are forty-four ointments in the B.P. They may be divided into two classes, *viz.*—(1) *General* and (2) *Special*. Special ointments may again be subdivided into *Lead* and *Mercurial ointments*. Thirty come under **General**, four under **Lead** and ten under **Mercury**.

GENERAL OINTMENTS

Unguenta	Composition	Strength	Action and use
Acidi Borici	Boric acid 1 oz., white paraffin ointment 9 ozs.	1 in 10	Antiseptic
Acidi Carbolic	Phenol $\frac{1}{2}$ oz., glycerin $1\frac{1}{2}$ ozs., white paraffin ointment 10 $\frac{1}{2}$ ozs.	1 in 25	Antiseptic and deodorant
Acidi Salicylici	Salicylic acid 10 grs., paraffin ointment 490 grs.	1 in 50	Antiseptic
Aconitinæ	Aconitine 10 grs., oleic acid 80 grs., lard 110 grs.	1 in 50	A powerful local anæsthetic and sedative
Aquæ Rosæ (Cold Cream)	Rose-water undiluted 7 ozs., white beeswax 14 ozs., spermaceti $\frac{1}{2}$ ozs., almond oil 9 ozs., oil of rose 8 ms.	7 in 19	Fragrant, emollient and demulcent
Atropinæ	Atropine 10 grs., oleic acid 40 grs., lard 450 grs.	1 in 50	A local anæsthetic
Belladonnæ	Liquid extract (evaporated) 2 ozs., benzoated lard 24 ozs.	6 in 100	Anodyne and antispasmodic
Cantharidis	Cantharides 1 oz., benzoated lard 10 ozs.	1 in 10	Rubefacient
Capsici (Known as Chili Paste)	Fruit 120 gr., spermaceti 60 grs., olive oil 1 oz.	1 in 42	Rubefacient

Unguentum	Composition	Strength	Action and use
Cetacei	Spermaceti 20 ozs., white beeswax 8 ozs., almond oil 72 ozs., benzoin 2 ozs.	1 in 5	Emollient and demulcent
Chrysarobini	Chrysarobin 20 grs., benzoated lard 480 grs.	1 in 25	Antiparasitic and a stimulant application for psoriasis
Cocainæ	Cocaine 20 grs., oleic acid 80 grs., lard 400 grs.	1 in 25	A local anæsthetic
Conii	Conium juice 2 ozs., hydrous wool fat $\frac{1}{2}$ oz.	2 in 1	A local anodyne in painful conditions of anus and rectum
Creosoti	Creosote 1 oz., hard paraffin 4 ozs., soft paraffin (white) 5 ozs.	1 in 10	Antiseptic
Eucalypti	Oil of eucalyptus 1 oz., hard paraffin 4 ozs., soft paraffin (white) 5 ozs.	1 in 10	Antiseptic
Gallæ	Galls 1 oz., benzoated lard 4 ozs.	1 in 5	An astringent application for hemorrhoids
Gallæ c. Opio	Gall ointment 925 grs., powdered opium 75 grs.	$7\frac{1}{2}$ opium	Anodyne and astringent in inflamed piles
Hamamelidis	Liquid extract $\frac{1}{2}$ oz., hydrous wool fat $2\frac{1}{2}$ ozs.	1 in 10	Astringent for piles
Iodi	Iodine 20 grs., potassium iodide 20 gr., glycerin 60 grs., lard 400 grs.	1 in 25	Irritant, resolvent, and alterative
Iodoformi	Iodoform $\frac{1}{2}$ oz., paraffin ointment (yellow) $2\frac{1}{2}$ ozs.	1 in 10	Disinfectant, antiseptic and antisiphilitic
Paraffini	Hard paraffin 3 ozs., soft paraffin 7 ozs.	3 and 7 in 10	A basis for ointment (demulcent)
Piers Liquidæ	Larva 1 oz., yellow bees wax 2 ozs.	5 in 7	A local stimulant and antiseptic
Potassæ Iodidi	Potassium iodide 50 grs., potassium carbonate 3 grs., water 47 grs., benzoated lard 400 gr.	1 in 10	Alterative and resolvent
Resinæ <i>basilicæ</i> <i>castaneæ</i>	Resin 8 ozs., yellow bees wax 8 ozs., olive oil 8 ozs., lard 6 ozs.	1 in 34	Stimulant to indolent sores
Staphisagriæ	Seeds 2 ozs., yellow bees wax 1 oz., benzoated lard $8\frac{1}{2}$ ozs.	1 in 5	Parasiticide Destroys pediculi
Sulphuris	Sublimed sulphur 1 oz., benzoated lard 9 ozs.	1 in 10	Antiparasitic. Cures scabies
Sulphuris Iodidi	Sulphur iodide 20 gr., glycerin 20 grs., benzoated lard 400 grs.	1 in 25	Antiparasitic and a local stimulant

Unguentum	Composition	Strength	Action and use
Veratrinæ	Veratrine 10 grs., oleic acid 40 grs., lard 450 grs.	1 in 50	A local anæsthetic
Zinci	Zinc oxide 3 ozs., benzoated lard 17 ozs.	3 in 20	A mild astringent for eczema
Zinci Oleatis	Zinc sulphate 2 ozs., hard soap shavings 4 ozs., boiling water and white soft paraffin of each <i>q.s.</i>	1 in 2	A mild astringent for eczema

Four ointments contain alkaloids; *viz.*:—Ung. Aconitinæ, Ung. Atropinæ, Ung. Cocainæ and Ung. Veratrinæ. They are all prepared with Oleic Acid and Lard.

LEAD OINTMENTS

Unguentum	Composition	Strength	Action and use
Glycerini Plumbi Subacetatis	Glycerin of lead subacetate 1 oz., white paraffin ointment 5 ozs.	1 in 6	A local mild astringent and sedative
Plumbi Acetatis	Acetate of lead 20 grs., white paraffin ointment 480 grs.	1 in 25	Do.
Plumbi Carbonatis	Lead carbonate $\frac{1}{2}$ oz., white paraffin ointment $2\frac{1}{2}$ ozs.	1 in 10	A local mild astringent
Plumbi Iodidi	Lead iodide $\frac{1}{2}$ oz., yellow paraffin ointment $2\frac{1}{2}$ ozs.	1 in 10	Alterative and resolvent for chronic glandular enlargements

MERCURIAL OINTMENTS

Unguentum	Composition	Strength	Action and use
Hydrargyri (Blue Ointment)	Mercury 1 lb., lard 1 lb., prepared suet 1 oz.	1 in 2	Resolvent, antiparasitic, antisymphilitic
Hydrargyri Ammoniati (White Precipitate Ointment)	Ammoniated mercury 1 oz., white paraffin ointment 9 ozs.	1 in 10	Antiparasitic. Destroys pediculi. Useful in chronic skin diseases
Hydrarg. Comn. (Substitute for Scott's Ointment)	Mercury ointment 10 ozs., yellow beeswax 6 ozs., olive oil 6 ozs., camphor 3 ozs.	1 in 5 of mercury	Absorbent. Useful in carbuncles, indolent tumours, glandular enlargement, &c.
Hydrargyri Iodidi Rubri	Red iodide 20 grs., benzoated lard 480 grs.	1 in 25	A local stimulating absorbent and rubefacient. Used in goitre

Unguentum	Composition	Strength	Action and use
Hydrarg. Nitratis (<i>Citrine Ointment</i>)	Mercury 1 oz., nitric acid 3 ozs., lard 4 ozs., olive oil 7 ozs.	1 in 15 of mercury	A local alterative, astringent and stimulant
Hydrarg. Nitratis Dil.	Mercuric nitrate ointment 1 oz. and yellow soft paraffin 4 ozs.	1 in 5	Same as above. Invaluable in inveterate eczema and tinea tarsi
Hydrarg. Oleatis	Mercuric oleate 1 oz., benzoated lard 3 ozs.	1 in 4	Same as Ung. Hydrarg. but more easily absorbed
Hydrarg. Oxidi Flavi (Substitute for <i>Golden Ointment</i>)	Yellow mercuric oxide 10 grs., soft paraffin (yellow) 490 grs.	1 in 50	Alterative, stimulant. In chronic eczema, ringworm, syphilitic eruptions. Diluted in conjunctivitis
Hydrarg. Oxidi Rubri (<i>Red Precipitate Ointment</i>)	Red mercuric oxide $\frac{1}{2}$ oz., yellow paraffin ointment $2\frac{1}{2}$ oz.	1 in 10	Caustic. Diluted, same as above
Hydrarg. Subchloridi (<i>Calomel Ointment</i>)	Mercurous chloride $\frac{1}{2}$ oz., benzoated lard $2\frac{1}{2}$ ozs.	1 in 10	Antisyphilitic, alterative and resolvent. Relieves itching, rarely causes salivation

Vina. Wines are weak tinctures of drugs made with sherry or orange wine instead of alcohol. These are prepared either by solution or maceration like tinctures, but never by percolation. Sherry (16% alcohol) is the menstruum for all the official medicated Wines, except Vin. Ferri Citratis and Vin. Quininae which are made with Orange wine (10% alcohol). The sherry must be good, otherwise the wines will quickly spoil. They are eight in number including Vinum Auranti and Vinum Xericum.

Vinum	Composition	Process	Strength	Dose
Antimoniale	Tartarated antimony 40 grs., boiling water 1 oz., sherry <i>q.s.</i> to 1 pt.	S.	2 grs. in 1 oz.	10 to 30 m. or 2 to 4 drs.
Colchici	Corm 4 ozs., sherry 1 pt.	M.	1 in 5	10 to 30 m.
Ferri	Iron wire 1 oz., sherry 1 pt.	M.	Variable	1 to 4 drs.
Ferri Citratis	Iron and ammonium citrate 160 grs., orange wine <i>q.s.</i> to 1 pt.	M.	1 gr. in 1 dr.	1 to 4 drs.
Ipecacuanhae	Liquid extract 1 oz., sherry 19 ozs.	M.	1 in 20	10 to 30 m. or 4 to 6 drs.
Quininae	Quinine hydrochloride 20 grs., orange wine 1 pt.	S.	1 gr. to 1 oz.	$\frac{1}{2}$ to 1 oz.

NON-OFFICIAL OR NON-PHARMACOPŒIAL PREPARATIONS

Few medical practitioners of the present day confine their prescriptions to the range of the official Pharmacopœia. They use a host of other preparations, which are being daily brought to their notice by enterprising manufacturing pharmacists. The list is ever increasing. We therefore limit our descriptions to those which are in ordinary use.

Balnea. Baths.—The immersion of the whole or a part of the body in some liquid or vapour is called a bath. It is said to be **general** when the whole body is brought under its influence, and **local** when a part only.

Properly speaking, only medicated baths come under non-official preparations; but we think this is a fit place for giving a description of the different kinds of medicated and non-medicated baths. Dr. Brunton has classified them as follows:

- | | | | | | |
|----------|---|--------------|---|------|---|
| I. Water | <div style="font-size: 4em; line-height: 1; padding: 0 10px;">{</div> | A. Simple | <div style="font-size: 4em; line-height: 1; padding: 0 10px;">{</div> | Cold | <div style="font-size: 4em; line-height: 1; padding: 0 10px;">{</div> <ol style="list-style-type: none"> (1) Ordinary full bath (2) Affusions (3) Spray (4) Sitz-bath (5) Foot-bath (6) Cold pack (7) Compresses (8) Douches |
| | | | | Hot | <div style="font-size: 4em; line-height: 1; padding: 0 10px;">{</div> <ol style="list-style-type: none"> (1) Tepid bath (2) Warm bath (3) Hot bath (4) Hot foot-bath (5) Hot sitz-bath |
| | | B. Medicated | | | <div style="font-size: 4em; line-height: 1; padding: 0 10px;">{</div> <ol style="list-style-type: none"> (1) Sea-bathing (2) Common Saline-bath. Artificial sea-water made by dissolving bay salt in water (1 lb of salt in 30 gals. of water) (3) Carbonic acid and saline (4) Acid bath (5) Alkaline bath (6) Sulphurated bath (7) Mustard bath (8) Pine bath (Fichtennadelbad) |
-
- | | | | | | |
|------------|---|-----------------------------------|--------------|---|---|
| II. Vapour | <div style="font-size: 4em; line-height: 1; padding: 0 10px;">{</div> | A. Aqueous | 1. Simple | <div style="font-size: 4em; line-height: 1; padding: 0 10px;">{</div> | <div style="font-size: 4em; line-height: 1; padding: 0 10px;">{</div> <ol style="list-style-type: none"> Russian Simple Vapour |
| | | | 2. Medicated | | Vinegar |
| | | B. Volatilized drug, e.g. Calomel | | | |
-
- | | | |
|----------|---|---------------|
| III. Air | <div style="font-size: 4em; line-height: 1; padding: 0 10px;">{</div> | Turkish bath. |
|----------|---|---------------|

Of these a few demand more than a passing notice:—

A. Cold Bath.—Temp. 35° to 70° F. Average 50° to 60° F. It has a powerful **tonic** action, increasing digestion, metabolism and body weight,

but in order to obtain these effects the bath should not be continued long after the primary reaction has set in. If it is prolonged it may cause secondary depression followed by delayed reaction. In fevers, it **abstracts heat**, and thereby lessens tissue change and prevents complications; hence it is very useful in hyperpyrexia of **rheumatism, typhus, typhoid, and remittent fevers, and pneumonia**. The bath must be repeated if the temperature rises. There are several ways of using a cold bath. The following are a few examples:—

1. **Cold Affusion.**—In which 5 to 6 gallons of cold water are thrown over the body. It is valuable for resuscitating persons from **syncope, narcotic poisoning, convulsions, sunstroke, hysteria, &c.**

2. **River Bath.**—Bathing in the river is more invigorating than a full cold bath either in a tub, reservoir, or tank. It stimulates digestion, gives tone to the system and strengthens muscles, especially if it is accompanied by swimming, or if the current of the water is very strong.

3. **Cold Shower Bath** is an effective **tonic**, being useful in **mania, hysteria, sunstroke, &c.** **Needle Bath** is a shower bath thrown in a fine spray.

4. **Cold Sitz-Bath or Cold Hip-Bath.**—In this a person sits in a tub with the water up to his hips. The vessels of the cooled surface and intestines first contract and then dilate, especially when friction is applied.

5. **Cold Foot-Bath** tones the system and strengthens the feet, but it is to be avoided during the menstrual period. The Hindu females of Bengal, who walk bare-footed and wash their feet many times a day, can bathe with impunity at this time.

6. **Cold Wet-Sheet Pack** is done thus:—Spread two blankets over the bed taking care to cover the pillow. Thoroughly wet a bed-sheet and spread it over them. Strip the patient naked and make him lie flat on the sheet. Wrap him up *tightly* in the sheet and blankets, the ends of the sheet being carefully tucked in on each side and the feet covered. Cover him with two or more blankets, the face being left open. After a short feeling of chilliness the patient experiences a delightful glow followed by copious perspiration, thereby reducing the temperature, delirium, and irritability. After $\frac{1}{2}$ to 1 hour the packing is removed and the body well rubbed with dry towels.

Instead of cold, tepid or warm water may be substituted. The above description applies to **general packing**, which is usefully employed in **specific fevers**, such as measles, scarlatina, small-pox, &c., to help the development of the rash, or to bring it out if it has receded. To reduce **delirium, excitement, and hyperpyrexia**, and in **mania and insomnia**, it is always useful. A **local wet pack** can be used in pneumonia, chronic diarrhoea, &c. A **cold compress** round the throat checks the inflammation of acute tonsillitis, whilst a similar compress on the stomach will often check obstinate vomiting.

7. **Cold Douche.**—In this a single stream of water is forcibly directed against a part of the body. Its effects depend mainly upon the size, height, and temperature of the stream, as well as the extent of the surface affected. The douche can be usefully directed against (a) *head*, in alcoholic coma and narcotic poisoning; (b) the *spine*, in spermatorrhoea, melancholia, and general debility; (c) *liver and spleen*, for chronic congestion

and enlargement; (*d*) the *joints*, for chronic inflammation and stiffness; (*e*) the *perinæum*, in which case an **ascending douche** with a rose is used, in pruritus ani. hæmorrhoids and spermatorrhœa; (*g*) the *vagina*, in leucorrhœa; (*h*) the *rectum*, in constipation and hæmorrhage.

8. Cold Sponging.—In this the surface of the body is freely sponged over while the patient is sitting or standing on a shallow tub. It has a tonic and bracing effect, serviceable in laryngismus stridulus, chorea, rickets, spermatorrhœa, &c.

9. Ice Bag and Leiter's Coil.—For local application of cold to the head, chest, or abdomen, an india-rubber bag filled with ice or a closely wound coil of metal tubing through which a continuous stream of water is allowed to flow out, may be applied.

10. A Freezing Mixture consisting of powdered ice 2 parts, common salt 1 part is very useful in minor operations and in chronic rheumatism. It causes anæsthesia and may vesicate if left too long in contact with the skin.

B. Warm or Hot Bath.—It may be either *medicated* or *non-medicated*, *general* or *local*. It (*a*) softens the dermis and liquefies the fatty secretions, and hence acts as a good **detergent** in many scaly and scabby skin diseases; (*b*) stimulates local circulation and lessens that of the internal organs, whereby relieves **pain** of intestinal, biliary, and renal colics; (*c*) relaxes tissues and relieves muscular spasms in urethral stricture, colics, laryngeal spasms, hernia, infantile convulsions, &c.; and (*d*) stimulates the secretion of sudoriferous glands, by which many kidney diseases are benefited and uræmia may be averted.

Great care should be taken during and after a hot bath. The patient must be quickly dried, covered, and put in a warm bed. A cup of hot tea, hot milk, or hot water greatly helps diaphoresis.

1. Tepid Bath.—Temp. 85° to 95° F. It has a detergent, sedative, and antipyretic effect. Useful in pyrexia and restlessness.

2. Warm Bath.—Temp. 95° to 100° F. Used in fevers, threatening inflammatory affections, &c.; as bronchitis, pneumonia.

3. Hot Bath.—Temp. 100° to 106° F. Action is the same as above, but more powerful.

4. Hot Foot-Bath.—To arrest threatened catarrh, cold in the head, epistaxis, infantile convulsions, and to restore menstrual discharge stopped by cold.

5. Hot Sitz-Bath.—Useful in amenorrhœa, dysmenorrhœa, sudden cessation of menstruation from cold, dysuria, cystitis, &c. The addition of a little **mustard** helps to re-establish the menstrual flow more quickly.

6. Hot-Water Sponging.—Sponging the head, temples, and neck with hot water relieves the headache in influenza, catarrh, and other diseases.

7. Hot Douche.—A very hot uterine douche, temperature between 110° and 115° is the best method at our disposal for checking post-partum hæmorrhage.

8. Sir J. Simpson's Poor Man's Bath is made by filling six to eight bottles with hot water and then wrapping them in stockings wet with hot water. These are put by the side of the patient under blankets.

9. **Fomentations and Hot Poultices** are local warm baths (which see).

C. Medicated Baths.—In these, medicinal agents are dissolved in cold or warm water. They may be divided into the following :—

1. **Sea Bath.**—On account of the various saline ingredients held in solution, sea-bathing is especially invigorating and stimulating to the skin; particularly when the water is boisterous. Moreover, the temperature being more or less uniform, sea-bathing is more easily borne by the weak than river-bathing.

2. **Carbonic Acid Bath.**—This is a stimulating saline bath containing Sodium Chloride 3 p.c., Calcium Chloride 1 p.c., Carbonic Acid Gas (free) up to 3 grammes to 1 litre. Recommended in heart diseases either functional or organic. The effect of the **Nauheim Bath** is due to its saline and gaseous constituents.

3. **Acid Bath.**—In this a flannel roller 1 foot broad is soaked in a bath containing diluted nitro-hydrochloric acid 8 ozs. in 1 gallon of water at 98° F., and wrapped twice round the hepatic region, after wringing out the superfluous lotion. It is now completely covered by a piece of oiled silk leaving a little margin. The bath should be renewed morning and evening and worn for days. Useful in hepatic disorders.

4. **Alkaline Bath** is made by dissolving crystallised Sodium Carbonate (1 dr. to 1 gal.) in water, and is useful in removing scabs and scaly incrustations.

5. **Mustard Bath** ($\frac{1}{2}$ to 1 dr. in 1 gallon).—A powerful stimulant to the skin, used to quicken the appearance of exanthematous eruptions. The patient should remain in the bath from 5 to 10 minutes.

6. **Bran Bath.**—Bran 4 lbs. are boiled in water 1 gallon and strained. This liquor is added to water sufficient for a bath. It removes irritation of the skin.

7. **Nim Bath.**—It is prepared by adding the decoction of leaves of *Melia azadirachta* to the ordinary bath. It may be general or local, and is largely employed by natives of India in various skin diseases. The writer has cured two obstinate cases of urticaria by giving daily *Nim* baths.

8. **Mineral Water Bath.**—A course of baths in any of the spas has special advantages. The effects of a bath in simple thermal water are similar to those derived from an ordinary warm bath; but they differ according to the composition of the mineral waters. Thus, bathing in and drinking sulphur water are very efficacious in chronic rheumatism, gout, hepatic congestion, &c.

D. Vapour Bath.—This may be aqueous or medicated. A **Steam Bath** may be made by boiling water over a spirit-lamp under a cane-bottomed chair, on which the patient sits, enveloped completely, except the head, by one or two blankets. Action and uses are the same as those of hot water bath. The **Russian Bath** consists in exposure of the body to moist vapour at different temperatures. It is said to be risky to persons with weak hearts, and there is certainly more danger of heat stroke than in the **Turkish Bath**, in which only dry air is used. Either of these baths is useful in rheumatism, gout, malarious fever, renal and skin diseases.

E. Air Bath.—Hot-air bath may be employed like a steam bath, by simply burning a spirit-lamp under the bed-clothes, which are supported on a framework. An excellent method of treating chronic stiff joints is to enclose them in a copper chamber and then apply dry heat at 180° F.

SCALE OF TEMPERATURES OF BATHS (Startin)

Bath	Water	Vapour	Hot Air
Cold . . .	33° to 65° F.		
Cool . . .	65° to 75° F.		
Temperate . . .	75° to 85° F.		
Tepid . . .	85° to 92° F.	90° to 100° F.	96° to 106° F.
Warm . . .	92° to 98° F.	100° to 115° F.	106° to 120° F.
Hot . . .	98° to 112° F.	115° to 140° F.	125° to 170° F.

Bolus.—A bolus is a large pill containing over 10 grains of powdered ingredients. In England, when a bolus is ordered, it is dispensed as one large firm pill. Such is also the case in Calcutta. But in Ireland and elsewhere it is sent out as a soft paste or confection wrapped in waxed or oiled paper, folded like a powder, with directions to scrape it off with a spoon and to swallow it down like jam. The most convenient plan, when a large dose of nauseous powder is to be administered, is to give it in a cachet or wafer paper.

Buginaria. Bougies are elongated cylindrical preparations containing active drugs mixed with the suppository basis for introduction into the rectal and the nasal cavities. Bougies are made like suppositories but differ from them in shape. They can be made in a metallic mould, but the basis must first be liquefied and thoroughly mixed with the drugs, otherwise as the bore of the mould is narrow, there is a likelihood of its becoming clogged as the mixture solidifies.

A most convenient method is to pour the melted mixture into a long glass tube of suitable calibre and allow it to set. It can then be pushed out by means of a glass rod and cut into the required lengths; the end being rounded off by rolling it between the fingers.

Antrophores are medicated bougies containing a spiral spring wound with fine wire, and coated first with an insoluble layer of white gelatin and then with a diluted mucilage. They may be medicated with cocaine, iodoform, protargol, &c. Those medicated with Thallin 2½ to 5 or 10% have been found useful in chronic gonorrhœa and gleet.

Cachets are wafer-paper capsules. They consist of two concave or watch-glass shaped halves or discs of wafer-paper stuck together at the rims by moisture. Any nauseous or bitter drug can be thus enclosed between the two halves and swallowed without being tasted. Cachets should be dipped in water immediately before swallowing.

Capsules.—A capsule is a gelatin sac enveloping a dose of some nauseous or disagreeable drug.

Carbasa Antiseptica.—**Antiseptic Gauzes** are mulmuls steeped in some antiseptic solution and dried afterwards. It is not easy to prepare them on a small scale. When the antiseptic is volatile, resin and oil should be combined with it. The following is the process for an extemporaneous preparation. Take 2 yards of gauze having 30 threads to the linear inch, hang it over a string, and spray over it uniformly the required volume of antiseptic solution on each side, turning once or twice until the whole of it is used. Or the folded gauze may be dipped into the solution in a deep dish, and turned over and over until the whole of it is equally absorbed, and then taken out, unfolded, and dried.

Cataplasmata. Cataplasms.—**Poultices** consist of linseed meal, bread, or starch made into a soft paste with hot or cold water for local application. They may be **hot or cold, medicated or non-medicated**. A hot poultice is the best means of locally applying warmth and moisture as well as medicaments. To prepare a hot linseed poultice, the linseed meal is mixed with boiling water with constant stirring; it should never be made by boiling the meal and water together. It must be of smooth consistency, and not lumpy, and it must be nicely moist, neither too wet nor too dry. Now, spread quickly and evenly over a piece of muslin of the required shape and size, keeping its margins about 2 inches free for turning over the poultice. After application it must be covered with flannel to maintain heat, and kept in place by a bandage. If it is made with powdered cake instead of crushed linseed, some linseed or olive oil is to be added. Bread, flour with milk or water, also make good poultices. Hot bran poultice, though lighter, soon gets cold unless put in a flannel bag.

If the poultice is intended for a sore, boil, or abscess, the poultice material must be in direct contact with the skin.

Ice poultice can be prepared by spreading over a twofold piece of gutta-percha tissue a thin layer of cotton-wool, and over it a layer of powdered ice and a little salt; and then covering the ice with the remaining half of the gutta-percha and sealing the margins with chloroform. The whole thing being placed within a flannel bag. Sometimes a layer of linseed-meal is put on the ice. Useful in pneumonia and pleurisy.

Tokmalanga or *Tokmari* (seeds of *Ocimum basilicum*) make a capital demulcent and emollient cold poultice when soaked in water for a few minutes.

Neem Poultice.—A poultice of the leaves of *Melia azadirachta* is a very valuable soothing application.

Cerata.—**Cerates** are ointments whose basis contains wax. They are official in the U.S.P. They are harder than ordinary ointments, but softer than plasters.

Cigarettes are made in the same way as ordinary cigarettes, except that certain drugs are substituted for tobacco; as Arsenical and Datura Cigarettes.

Chloroform Tinctures.—These are tinctures of drugs made with chloroform instead of alcohol; as Chloroformum Aconiti and Chloroformum Belladonnae, B.P.C. (see Aconite and Belladonna).

Collunaria are lotions used as nasal douches.

Collutoires are throat or mouth paints; as *Glycerinum Acidi Borici*. *Collutoire* is a French term.

Collyria are eye-lotions or eye-washes. Sometimes they are called eye-drops.

Cremora.—**Creams** are soft or semi-liquid preparations for external application; having glycerin, vaselin, or some similar substances as a basis, *e.g.* Cold Cream.

Dentifrices are preparations for cleansing the teeth. They may be a powder, paste, soap, or liquid.

Depilatories are preparations used for the removal of superfluous hair. Their effects depend upon the presence of a sulphide and a caustic alkali. The freshly prepared paste is applied in a thick layer over the affected part and allowed to remain for 5 or 10 minutes. It is then scraped off with a blunt knife and cold cream applied to the inflamed skin. Deep and painful ulcerations may result from incautious application of chemical pastes. Those containing orpiment are more dangerous than those having barium sulphide.

Elæosacchara. Aromatic Sugars or Oil Sugars.—These are more common on the Continent than in England, and are made by triturating 9 minims of volatile oils to 1 oz. of sugar. They are used as flavouring agents. Anise, Fennel, Peppermint have *Elæosacchara*.

Elixiria. Elixirs.—These are weak tinctures of drugs rendered pleasant and agreeable by the admixture of sugar and aromatics.

Emulsiones.—**Emulsions** are mixtures of insoluble drugs minutely divided and suspended in water by mucilage or other substances. An emulsion can be made by (1) *saponification*, by adding an alkali or Tr. Quillaie or Tr. Senegæ to a fixed oil; and by (2) *suspension* of a resinous substance in mucilage or yolks of eggs; as emulsion of the oil of turpentine.

Enemata. Enemas. Clysters. Lavements. Rectal Injections.—A liquid preparation introduced into or through the rectum by means of a suitable instrument is called an enema.

If the injection is meant to evacuate the bowels, 1 to 2 pints of liquid are injected, the patient lying on his left side; but when it is intended that it should be retained, a small quantity—2 to 4 ozs.—should be used. If it is considered desirable to introduce 3 to 6 pints, the liquid must be slowly thrown up the bowel while the patient is lying first on his left, then on his right side with his pelvis raised, or, if necessary, on his knees and elbows, pressing the anus with a towel, whenever there are expulsive cramps. This is best done by slowly pouring the fluid into a funnel to which a long gum-elastic tube is attached. It then flows steadily as the result of hydrostatic pressure and is less likely to be ejected. This process is called *Enteroclysis*. It must be borne in mind that the process of injection should be carried on slowly and with occasional pauses, otherwise the enema will be expelled by premature contraction of the intestine. The temperature of the liquid should be about 98° F. Cold water is soon rejected.

The following are the chief varieties of enemas with their uses:—

1. **Anthelmintic Enemata** are chiefly used to expel thread-worms (*see Anthelmintics*).

2. **Antispasmodic Enemata.**—For this purpose an injection of Oil of Turpentine, Asafetida, Bromides, Hydrate of Chloral, Ether, &c., is given when the intestine is distended with flatus or getting cramped; as Enema Terebinthinæ, Enema Asafetide, &c. Enema Tabaci is very depressant and its use has been discontinued.

3. **Astringent Enemata.**—These are used for checking diarrhœa, rectal hæmorrhage, and mucous discharge from the rectum and lower bowels.

4. **Emollient Enemata.**—A decoction of starch, linseed, or barley soothes the irritable mucous membrane of the rectum and colon.

5. **Sedative Enemata.**—These are used in painful affections of the rectum, bladder, and uterus. Opium is used for this purpose.

6. **Purgative Enemata.**—These are often resorted to when the lower bowels are to be evacuated. Ordinarily, for an adult 1 pint, for a child of four years of age 4 to 6 ozs., and for an infant 1 oz., are enough. Soap and warm water, thin gruel, and castor oil or olive oil, &c., are often used for this purpose. Glycerin, 1 to 2 dis., injected by means of a suitable syringe, or a glycerin suppository introduced into the rectum, evacuates the bowels speedily (*see p. 49*), and may be used in native practice without much objection.

7. **Nutrient Enemata.**—In cases where food cannot be swallowed by the mouth or retained by the stomach, peptonised milk, beef tea, eggs beaten up either alone or with brandy or milk, &c., may be injected but not more than 4 ozs. at a time. Irritability of the rectum may be checked by the addition of a few drops of *Liquor Opii Sedativus*. Rectal digestion is greatly facilitated by the combination of pancreatin and pepsin with nutrient enemata. Before the nutrient enema is given the bowels should be washed out each morning with tepid water.

8. **Suppositories of Predigested Food.**—Meat and milk can be introduced when the rectum rejects liquid nutrient enemata. Unfortunately no reliance whatever can be placed on these suppositories which usually remain unabsorbed.

Fomenta.—**Fomentations** consist of flannels, cloths, or sponges wrung out of hot water to which a drug may or may not have been added, for application to the surface of the body.

The proper way to apply fomentations is to take a twofold piece of flannel large enough to cover the affected part. Immerse this folded flannel in a kettle of boiling water or pour boiling water over it in a basin, and lift it by a pair of tongs or a stick, and put it on a wringer—a stout towel or duster with sticks attached to both ends. The water is then squeezed out as much as possible by the twisting of the sticks in opposite directions and the flannel is immediately applied to the affected part and covered with a large piece of indiarubber sheeting or oiled silk, extending about an inch beyond the flannel. Place over this a thick layer of cotton-wool and bandage. If the full effect of fomentation is desired, the flannel should be changed every 20 or 30 minutes. In many cases a sponge or a piece of spongio-pilino wrung out of boiling water forms a convenient form of fomentation. In the case of the feet, hands, or forearms, dipping them in hot water may do, but its temperature should be maintained by frequent small additions of boiling water.

If it is desired to produce a gentle counter-irritation, oil of turpentine may be sprinkled over the flannel before application. This forms the **turpentine-stupe**. For an anodyne or sedative action, laudanum may be sprinkled in the same way or a few poppy-heads or a little opium may be put into the water before boiling.

Dry fomentation is made by filling bags with hot bran, salt, sand, or chamomile flowers. Bottles filled with hot water and covered with flannel bags or old stockings may be used for dry fomentation. A piece of flannel roasted over fire and applied also serves the purpose.

The method of applying fomentations by the natives of India is dangerous and faulty. The process above described is never attended to. Only a piece of flannel is just squeezed out of boiling water and applied, and when cold it is again dipped into the boiling water leaving the fomented part exposed. The result is that the part fomented is exposed to alternate chills and heat. Even after fomentation, the part is not always covered. The student should learn the art and make it a point to see the fomentation done before him.

Hot antiseptic compresses.—These consist of folds of lint or cloth soaked in hot antiseptic lotions covered with a piece of waterproof or gutta-percha tissue; as Boric Acid Compress.

Fumigation is a local or general bath of volatilized drugs. Sulphur and mercury are chiefly used for this purpose. Mercurial fumigation, either *general* or *local*, has long been used in the treatment of secondary syphilis.

General mercurial fumigation is carried out in the following way:—The best apparatus for a mercurial vapour bath is that of Henry Lee. It consists of a spirit lamp enclosed in a case of wire gauze, on the top of which is a small plate surrounded by a porcelain trough. About an ounce of water is poured into the trough and the lamp is lighted. When the water begins to boil, 20 to 30 grains of resublimed Calomel are sprinkled on the plate, and the apparatus is placed under a chair, on which the patient sits undressed, but surrounded by a moleskin or indiarubber cloak tied round his neck, though kept away from his body by a cane hoop. If necessary, the slit of the cloak can be opened from time to time, to allow the vapour to be inhaled. The patient should be in the bath for about $\frac{1}{2}$ hour and then removed to bed with his cloak on. The patient must not be left alone during the bath, lest he should faint.

Local mercurial fumigation is serviceable in obstinate syphilitic affections of the skin and mucous membranes.

Sulphur fumigation cures scabies.

Gargarismata. Gargles.—A gargle is a liquid preparation used for topical action on the mouth, throat, and pharynx. A gargle may be any of the following kinds:—

1. **Tonic Gargle**, that tones the muscles of the pharynx and soft palate; as cold or iced water.

2. **Antiphlogistic Gargle**, that removes any local inflammation; as Potassium Chlorate, Borax, Liq. Ammonii Acetatis with warm water, Linseed Tea, &c.

3. **Stimulant Gargle**, that stimulates the mucous membrane and glands; as Capsicum (Tr. Capsicum 2 drs. to water 8 ozs.), Arnica, Myrrh, Pyre-

thrum, Eucalyptus Gum (2 drs. to 8 ozs.), &c. These gargles often relieve deafness due to obstruction of the Eustachian tube by increased pharyngeal secretion.

4. **Astringent Gargle**, that checks excessive secretion; as Iron salts, Zinc salts, Alum, Tannic Acid ($\frac{1}{2}$ dr. to 8 ozs.), astringent infusions, &c.

5. **Antiseptic Gargle**, that removes foul secretions and odours; as Carbolic Acid $\frac{1}{2}$ dr., to Rose-water 6 ozs. (Brunton), Boric Acid, Potassium Permanganate, &c.

6. **Demulcent Gargle**, that removes burning and irritation; as barley water, linseed tea, Isphagbul seed (*Plantago Isphaghula*), tea, milk, olive oil, &c., in irritant poisoning.

Gossipia Antiseptica.—**Antiseptic Cottons** are made by charging absorbent cotton-wool with various antiseptic drugs. This is done by soaking cotton in some saturated antiseptic fluid and afterwards drying it; as Gossip. Acid. Borici, Gossip. Acid. Salicylici, &c.

Granules are minute pills. Granular preparations are very popular. The B.P. effervescent preparations are granular (see p. 21).

Guttæ.—**Drops** are liquid preparations used as drops; as eye-drops, drops for the ear, &c.

Hauftus. Draught.—A liquid preparation or mixture when taken in a single dose is called a draught; as Castor Oil draught, Hydrate of Chloral draught, &c.

Injectiones. Injections.—A liquid introduced into the body by means of a suitable instrument is called an **Injection**. The Injections can be introduced into the

(1) *Natural Canals or open cavities* of the body; as external ear, Eustachian tube, nose, nasal duct, stomach, rectum (see *Enema*), urethra, bladder, vagina, and uterus.

(2) *Closed sacs*; as tunica vaginalis, serous cavities, synovial cavities, sheaths of tendons, cysts, and chronic abscesses.

(3) *Veins*; as transfusion of blood, infusion of milk and saline solutions.

(4) *Subcutaneous tissues and muscles*; as hypodermic injections.

Insufflationes are powders blown into the throat, nostrils, or larynx. Laryngeal insufflation can be managed thus:—A vulcanite tube curved at a suitable angle, having an aperture covered by a slide, through which the mediocal powder is introduced, is carried over the tongue to the laryngeal-orifice, and the powder is either blown in by the mouth or by an elastic ball attached to the end of the tube. This instrument is called the "Pulveriflator." A quill or a tube half filled with powder and blown by the mouth may do for nostrils and throat.

Jujubes are lozenges made of gum arabic and sugar. They are prepared by boiling to a suitable consistence, gum arabic 16 lbs., sugar 7 lbs., and water $\frac{1}{2}$ gal. They are sometimes covered with a coating of crystallized sugar.

Lanolinum is an ointment or cream having hydrous wool fat as its basis; as Lanolinum Hydragryi.

Linctus.—**Lincture** or **Loch** is a thin confection to be slowly swallowed in small doses, so as to act on the throat. The basis of linctus is either

treacle, syrup, honey, or any other sweet substance. When powders are the active ingredients they should be made very fine, before admixture with the basis.

Linteum.—**Lint** is lint impregnated with medicinal agents; as *Linteum Acidi Borici*, *Linteum Iodoformi*. These are prepared in the same way as antiseptic cottons.

Massæ.—**Masses** consist of ingredients mixed together to the consistence of a pill. They are official in the U.S.P.

Masticatories are solid pieces of drugs used for chewing; as *Pellitory Root*.

Mollinum is an ointment prepared with mollin or superfatted soap. It is easily washed off with water forming a lather and leaves the skin fresh and supple. As *Mollinum Hydrargyri*. Mollin contains 17 p.c. of uncombined fat and 30 p.c. of glycerin.

Nebulæ are solutions of drugs sprayed into the throat by the help of a spray-producer; as *Nebula Acidi Lactici*, *Paroleine*.

Opodeldocs or **Saponimenta** are preparations having as their basis soap liniment. Medicated Opodeldocs are official in Continental Pharmacopœias.

Pasta.—**Paste** is prepared like ointment, but generally without any fatty basis; as *Pasta Arsenicalis*, *Pasta Amyli Iodidi* (Tilbury Fox). It is better to confine the term *Pasta* to preparations for external application, and *Massa* to those for internal use; as *Massa Copalina* U.S.P.

Pastillus or **Pastil** is a soft jujube variously medicated having glyco-gelatin as its basis instead of gum arabic and sugar. These are used like lozenges. As *Pastillus Acidi Borici T.H.*

Perles are minute pills.

Pessi. **Pessaries** resemble suppositories, but are intended for introduction into the vagina. The active drugs are mixed either with cacao-butter or with gelatin mass. These may be *sedative*, *astringent* or *antiseptic*.

Pigmenta.—**Paints** are liquid preparations used for application to the throat, skin or other parts. A pigment differs from a collutoire in that the former is used as a paint for any part of the body, whereas the latter is for brushing the throat or mouth only. As *Pigmentum Acidi Borici*, *Pigmentum Acidi Tannici*, *Pigmentum Argenti Nitratis Etherium*, &c.

Pomades are greasy preparations resembling ointments, but used as dressings for the hair.

Sprays are liquid preparations intended for application to the upper air passages through an atomizer.

Steatina. **Steatins.** **Ung. Extensa** or **Salve Mulls** are ointments of a hard consistence spread on muslin, and capable of being folded and cut at pleasure. Mutton or beef suet form their principal basis.

Sticks or **Pencils** are solid cylindrical rods prepared by fusing drugs and pouring the melted mass into suitable moulds; as *Toughened* and *Mitigated Caustics*. When the melted mass is poured into a conical mould it is called a **cone**; as *Menthol Cone*.

Styles are thin bougies about 2 inches long for introduction into the lachrymal sac and nasal duct.

Tabellæ Hypodermica.—Hypodermic tablets are made with granular sodium sulphate or sugar of milk. They contain a definite quantity of the active ingredient and are easily soluble in water, so that they are very convenient for making hypodermic injections.

Triturationes.—**Triturations** are solid dilutions. These are intimate mixture of substances with sugar of milk. They are official in the U.S.P.

Vapores. Vapours. Inhalations.—These are drugs in a gaseous or atomised form brought in contact with the mucous membrane of the respiratory tract. The methods of inhalation vary with temperatures at which drugs volatilize. Chloroform, Ether, Bichloride of Methylene, Nitrite of Amyl vapourize at ordinary temperatures; but to volatilize Sublimed Sulphur and Calomel, high temperatures are necessary (*see* Fumigation, p. 70). The majority of drugs are vapourized through the medium of hot water or steam. Inhalation of vapours is best carried on from an inhaler (*see* Drugs that act on the Respiratory System).

Varnishes are preparations which, when applied to the skin, evaporate and leave a coating. Varnishes are often medicated.

Vaselineum.—Like Lanolinum, it is a term applied to an ointment having vaseline as its basis.

Wafer papers are used to wrap round nauseous or bitter powders to disguise their taste. They are made of flour and water, and become limp when moist. Cachets consist of the same material (*see* p. 66).

PART II

PHARMACY AND DISPENSING

HINTS FOR PRACTICAL PHARMACY AND DISPENSING

The extemporaneous formulæ or prescriptions given by a physician are called *Magistral*, because they are ordered by a *Magister*, i.e. master of his profession. The compounding and dispensing of these prescriptions are the ostensible duties of a dispenser. For the satisfactory discharge of these duties certain combinations of qualities are requisite in the individual undertaking them. "With some degree of physical strength and agility, he should combine a quick perception, sound judgment and firmness of resolution. He should maintain a constant and lively attention to every operation, however trifling, with which he may be occupied, and evince both by night and by day a readiness to fulfil his duty in serving others, even at the sacrifice of his own convenience and pleasure."

The following hints specially prepared are likely to prove useful both to the dispenser and practitioner.

GENERAL DIRECTIONS

1. **The Dispensing room** must be well *lighted* and well *equipped* with every necessary article, furniture and apparatus for compounding and dispensing purposes.

2. **Pure drugs of the best quality** procurable for money are to be used, and preparations are to be made in strict accordance with the *official* and other *accepted methods*.

3. **Bottles are to be duly labelled.** Those containing corrosive fluids must have *enrolled or stamped* names engraved on glass. Bottles containing **poisonous** substances must bear an extra label "**Poison**" - at their shoulder. It is a good plan to have also the *doses* printed on the labels.

4. **Poisonous drugs** must be kept within a separate glass case under lock and key.

5. **The counter and the apparatus** for compounding and dispensing must be kept scrupulously clean in good order, and ready for immediate use. Always clean and put away every article in its proper place after use.

6. **Testing of drugs** must be done occasionally so as to ensure their purity and strength. Substances like vegetable extracts, spirit of nitrous ether, hydrocyanic acid dilute, &c., require occasional looking after.

7. **Corks of good quality** should be used. Cracked, old, rotten and soiled corks should always be rejected. The practice of pressing corks between the teeth should never be indulged in. Fit a cork before pouring the medicine into the bottle.

8. **Evidence of slovenliness** as regards externals does not encourage faith as to the care with which the contents have been dispensed.

9. **Prescription reading.**—Read through a prescription calmly and rapidly, without creating any suspicion in the mind of the presenter, but noting at the same time any inconsistency either in dosage or in combination.

10. **Consultation with the prescriber** must be arranged without delay wherever possible, if there is any **poisonous** or **unusually large dose**, or a grave **incompatibility** in a prescription. The dispenser should on no account alter a physician's prescription without his sanction.

11. **The Directions** on the label should be written first of all before the medicine is dispensed. At the same time the prescription should be copied in the copy-book, noting afterwards any peculiarity of compounding or dispensing. If the directions are in Latin, the dispenser should give their English translation. In India, the directions should be written in the familiar language of the place, when the medicines dispensed are meant for those who cannot read English.

12. **Labels** should be neatly and distinctly printed without much flourish, and their margins carefully trimmed. "**Poison**," "**Shake the bottle**," "**Not to be taken**" and other accessory labels are best placed on the **shoulder** of a bottle. If affixed at the foot, the fingers holding the bottle may cover them, or a hurried patient may overlook them. The colour of labels for liniment and lotion ought to be different from that for mixture and powder. Orange red and dark yellow for the former and white for the latter may be used. Sometimes the labels for liniment and lotion are printed with red ink on white paper.

13. **Bottles for dispensing** mixtures should be of a different colour from those used for liniments and lotions. Amber coloured or chromium bottles are best suited for silver nitrate lotions, and blue bottles for liniments. Bottles covered with blue paper can be used for silver lotions, when chromium or amber coloured bottles are not available.

14. **The dispensing of two prescriptions simultaneously** should never be attempted. But if an infusion is to be made the dispenser may set it on, noting on a bit of paper the time and the distance, and placing it between the cover and the pot.

15. **The position of a prescription during dispensing** must be such that the dispenser can read it while dispensing. This can be best accomplished either by fixing it to a hook on a counter shelf, or

by holding it between the index and the middle fingers of the left hand.

16. **Manipulation.**—Be expeditious in manipulation. Finish tying, sealing, labelling and wrapping as quickly as possible. The holding of powder envelopes between the lips, the handling of drugs, the stirring of mixtures with the fingers, is to be avoided.

17. **The final reading of a prescription** is essential before the medicine leaves the hands of a dispenser, so as to make a revision of his work. If there is any doubt, always begin where there is none.

18. **Wrong delivery.**—Be careful not to deliver a wrong medicine to the presenter of a prescription. A serial number entered upon both the original prescription, the copy in the dispenser's book and the label applied to the medicine, ought to prevent the occurrence of mistakes.

19. **Graduation of bottles** must be accurate. Want of symmetry of the bore makes a great deal of difference. Blown lines of graduation are generally wrong. Paper graduation is the best, but it must be done by hand in each case. Mark-papers should either be notched or lined equidistantly, but in either case the number of doses should be put down in figures on the label.

20. **Repetition of prescriptions.**—If a prescription contains such drugs as are likely to produce a cumulative effect, as Strychnine, Arsenic, Lead, Digitalis, &c., the dispenser should warn the patient against repeating it for a lengthened period, without the knowledge and sanction of the prescriber. To prevent indiscriminate renewals of medicines containing poisonous ingredients, the physician should write "*non-repetatur*" or some similar direction on his prescriptions.

WEIGHING AND MEASURING.

1. **Scale.**—An upright fixed beam and pan scale with a moveable glass-pan should be used. If a hand scale is used, hold it firmly by the left hand, never lift it too high above the counter, and judge of the weight as much by the indicator as by the position of the scale. A delicate scale should be used for weighing minute quantities of powerful drugs; such as Strychnine, Hyoscin, Arsenic, &c.

2. **Corroding substances.** Substances which corrode or act on the brass should be weighed upon glass pans. Crystallized acids, iodine, carbonate of ammonia and similar salts should never be weighed on brass pans.

3. **Soft or sticky substances.** such as soft extracts, confections, ointments, &c., should be weighed on a piece of paper spread over the right pan, after placing a corresponding piece of equal weight on the left along with the weight. Scrape the medicine by a spatula from the paper after weighing.

4. **No guesswork** in weighing or measuring is allowed. Every drug must be either weighed or measured as the case may demand.

5. **Label upwards.**—In pouring out liquids, always keep the label of the bottle upwards in order that it may not be spoiled by the trickling down of the drops of liquid left on the lip of the bottle.

6. **Minim measure.**—From a few drops to a drachm, the liquid should be measured in a minim glass. The true level of the surface of the liquid in a minim glass is the midway between the highest point close to the glass and the lowest at the centre.

✓ 7. **Castor Oil, Copaiba, Glycerin, &c.,** should be weighed instead of measured if not otherwise directed.

8. **Lip drops.**—The drops that hang from the lip of a bottle out of which a liquid has been poured, should be caught upon the bottom of the stopper, before putting it back into the mouth.

9. **How to drop.** Before permitting drops to fall into any mixture, the dispenser must allow a few drops to fall on the floor, till he is confident that he has a perfect control over dropping. If he is not sufficiently skilful, let him measure the drops into an empty glass until he is satisfied that he has obtained the correct number.

10. **Volatile liquids,** such as, Ether, Chloroform, Nitrite of Amyl, Diluted Hydrocyanic Acid, &c., should always be measured instead of dropped. A solution of 10 or 20 per cent may always be kept in stock for measuring out small quantities when ordered.

11. **The size of drops** varies considerably, and therefore it is safe to give *minims* where *guttae* are ordered. Thus, chloroform dropped from an ordinary phial will require 150 to 300 drops to one fluid drachm.

✓ 12. **Division of a grain or a minim** is best accomplished by triturating or mixing the weighed or measured quantity with sugar of milk or any liquid excipient, and dividing the mixture as ordered. For instance, suppose that 24 pills are ordered, each containing $\frac{1}{10}$ grain of Strychnine Hydrochloride. The total amount in the 24 pills will be $\frac{24}{10}$ = $2\frac{4}{10}$ = $2\frac{2}{5}$ grain, therefore weigh out 1 grain of the salt and triturate it with 14 grains of milk sugar, making 15 grains in all. Then 12 grains of this mixture will contain $\frac{1}{5}$ grain of Strychnine Hydrochloride. Take this amount and destroy the remainder.

13. **A liquid drug is always weighed** and never measured on the Continent.

WATERS

1. **Camphor water.** 2 ozs. of water dissolve only $\frac{1}{4}$ gr. of camphor. The easiest way of making a good camphor water, is to mix flowers of camphor with coarsely powdered glass, enclose and tie the mixture in

a muslin bag and suspend it by a thread into the water from the cork. A good solution is obtained sooner by moving the bag up and down two or three times a day.

By dissolving $2\frac{1}{2}$ drs. of spirit of camphor in 40 ozs. of water, camphor water may be quickly obtained.

2. **Chloroform water** is made by the simple shaking of chloroform in water.

3. **Mint waters** are best prepared by agitating oils in hot water, before pouring into the still, and immediately commencing distillation.

4. The following **alternative method** of preparations is sanctioned by the B.P. for use in India and the Colonies :—

“Aque Olei Anethi, Anisi, Carui, Cinnamomi, Feniculi, Menthae Piperitæ, Menthae Viridis, Pimentæ. Each of these waters may be prepared by triturating the corresponding oil with twice its weight of Calcium Phosphate and five hundred times its volume of Distilled Water and filtering the mixture. In India and other tropical countries these waters may be used in place of the corresponding *Aque* of the text of the Pharmacopœia.”

DECOCTIONS

1. **Drugs** should be coarsely powdered or sliced before they are boiled in water for 5 minutes or longer. If the comminution is too fine some sediment deposits. The drugs should always be put in cold water before boiling.

2. **Decoction pots** should be enamelled or tinned and covered. A false bottom made of tinned or silver gilded copper wire half an inch or more above the bottom should be used to prevent imparting a fusty odour to the decoction from the particles of the drug adhering to the bottom of the vessel during boiling.

INFUSIONS

1. **Drugs for infusion** should not be too finely comminuted.

2. **No other water than distilled water** boiling or cold is to be used.

3. **Suspension of drugs** is essential. A muslin bag containing the drugs can be suspended by a thread from the lid of a covered pot, or a Squire's or Maw's infusion pot may be used.

4. **Uniform temperature**, as far as possible, should be maintained.

5. **Hard spring water** does not give a good colour, as the extractive matters are not well dissolved by it.

6. **Whenever wanted** the infusion should be made fresh. If business is very brisk, the infusion can be made and preserved for two

or three weeks, by bottling hot infusions in 6 or 8 oz. bottles up to the brim, and then by covering their mouths and necks with bladder or by well-fitted stoppers, so as not to allow any air to get in.

7. **Concentrated infusions** can never supply the place of fresh ones. They are, however, useful for field hospitals. The concentrated infusion of digitalis is inactive.

EMULSIONS AND MIXTURES

Emulsion, as its name implies, is a liquid externally resembling milk. The milkiness is due to the suspension of resinous or oily bodies in water, by means of an adhesive substance known as the *emulsifier*.

Fixed Oils and **Viscid Substances** are best emulsified in a mortar, and volatile oils, alkaline emulsions and less viscid substances in bottles.

1. **The first fundamental rule** in the *compounding* of a mixture, is to avoid chemical decomposition taking place among its ingredients, unless such is the implied intention or the express order of the prescriber.

2. **Distilled water** is the official water to be used in compounding. Tap or other waters produce a considerable change in mixtures. For example, Tinct. Card. Co. produces a brilliant crimson colour with tap, and a reddish brown with distilled, water. Tinct. Lavand. Co. gives a bright mixture with distilled, and a muddy one with tap. Liquor Arsenicalis precipitates Calcium Carbonate with tap water. Hydrargyri Perchloridum produces an insoluble mercuric salt when dissolved in tap water. Tap water gives a muddy colour to a mixture containing Ferrum Tartaratum, and distilled water makes a clear solution.

3. **Order of mixing.** It is not the spirit of practical pharmacy to mix the ingredients in the order in which they are arranged in a prescription. The dispenser should exercise his own judgment in determining the best method of effecting a combination.

It is a good plan first to pour in the tinctures and spirituous fluids as they are measured, next add syrups and essences, and lastly fill up the bottle with the vehicle.

4. **Poisonous drugs** such as Arsenic, Strychnine, Perchloride of Mercury, Aconite, Digitalis, Belladonna, Opium, Hydrocyanic Acid Dilute, &c., should be separately dissolved and then added to the mixture last of all, immediately before corking the bottle. In this way you avoid the possibility of putting them in twice over.

5. **Mortar and pestle** should never be used if the ingredients are easily soluble. Dispense syrups and fluid preparations in such an order that the vehicle will finally rinse out the measure glass.

6. **Shaking.**—All mixtures should be briskly shaken before labelling, to ensure a thorough incorporation of the ingredients.

7. **Heat** should not be used to help the solution of salts when they will not entirely dissolve in cold water, for they are sure to crystallize on cooling. Suspension is the best method under such circumstances.

8. **Wholly or partially soluble vegetable drugs**, especially which contain tannin, should be *mixed with earthy and metallic salts in largely diluted solutions*.

9. **Gelatinous mixtures.**—Some mixtures become *gelatinous* on keeping, due to the growth of an organism called *viscous ferment*. An addition of 20 per cent. of alcohol to the mixture prevents this.

10. **Chemical reaction.**—If there is a chance of a chemical reaction taking place, the ingredients which are likely to act with one another, should be freely and separately diluted or suspended, before mixing. The mucilage of acacia always suspends the precipitate uniformly, and retards or modifies to some extent the chemical decomposition.

11. **Froth.**—Sometimes a lot of froth rises as the result of shaking, especially if the mixture contains vegetable solutions, thus preventing the bottle from being filled or corked. A few drops of alcohol removes this.

12. **Insoluble powders**, such as rhubarb, chalk, &c., should be triturated with a small quantity of water in a mortar to produce a thin paste, before mixing with the vehicle.

13. **Medicinal filtrates** produced in a mixture should not be filtered, but suspended. But if any foreign particles float on a clear solution, they should be removed either by straining or by filtration through wetted cotton or tow plunged lightly into the neck of a funnel. All mixtures depositing a sediment should bear the label "*shake the bottle.*"

14. **Mucilage** should be recently prepared, but it can be kept ready made for some time provided that the bottle containing it is full up to the neck and properly sealed.

15. **Oils** are best emulsified either by rubbing them up with gum or by mixing them with an alkali, or with both. Copaiba is well emulsified with gum and alkali. Essential oils require to be mixed either with some fixed oils before emulsification or with the yolks of eggs.

16. **Scale preparations** in a mixture are either to be dissolved in a mortar with warm water or poured into the bottle with the vehicle, and shaken briskly. If poured in a dry condition into the bottle, and the water or vehicle added afterwards, a sticky mass cakes at the bottom.

17. **Volatile ingredients in a mixture.**—Volatile drugs such as ammonia, ether, chloroform, hydrocyanic acid, sulphurous acid, &c.,

should never be mixed with hot fluids, and should always be added last of all, after the vehicle has been poured into the bottle. Care should be taken that sufficient space is left for the requisite quantity of the soluble ingredient. As soon as this has been added, the bottle must be tightly corked and well shaken.

MIXTURES AND EMULSIONS OF SPECIAL DRUGS

1. **Acacia** in a mixture is best added in the form of a mucilage, which should be freshly made.

2. **Almond oil** does not emulsify well with mucilage or powdered gum, but a small quantity of liquor potassæ or carbonate of potassium without mucilage answers well.

3. **Ammoniacum, Almond and Guaiacum** should be triturated first with a little water or some similar vehicle so as to form a thin paste, and then gradually mixed with the emulsifier.

4. **Ammonium Carbonate** should be dissolved in a cold vehicle, only translucent pieces being used. Those portions which have effervesced are wanting in strength.

5. **Benzoic acid** should be powdered before mixing. If there is a tincture in the formula it should be dissolved in it, and water added gradually with shaking.

6. **Bismuth Oxynitrate** is chemically incompatible with potassium bicarbonate or sodium bicarbonate, producing a large quantity of carbonic acid gas when mixed in a mixture. $2\text{BiONO}_3 + 2\text{NaHCO}_3 = \text{Bi}_2\text{O}_2\text{CO}_3 + 2\text{NaNO}_3 + \text{H}_2\text{O} + \text{CO}_2$. The gas must be allowed to escape by gentle heat before bottling. Otherwise the bottle may subsequently burst or the cork be suddenly blown out to the great alarm of the patient. An equivalent quantity of bismuth carbonate may be substituted as the finished mixture contains the same. Bismuth salts and iodides produce bismuth oxyiodide which gives a brownish-red colour to the mixture though therapeutically it is harmless.

7. **Borax** powdered and rubbed up with mucilage makes a soft, jelly-like mass. But a limpid mixture may be obtained by mixing freely diluted mucilage with a solution of borax in warm water.

8. **Butyl Chloral Hydrate** forms oily compounds with alcohol, insoluble in water. Dissolve in glycerin and warm water. **Chloral hydrate** behaves in the same way, and is decomposed by alkalis, liberating chloroform.

9. **Caffeine Citrate** forms a syrupy liquid when mixed with three times its weight of water; on addition of more water, caffeine hydrate is precipitated. This is again redissolved on further dilution.

10. **Chlorate of Potassium and Hydrochloric Acid.**—Sometimes a formula composed of Pot. Chloras. Acid. Hydrochloric and water comes to the dispenser for dispensing. Here, the object is to make a solution of chlorine, and is best fulfilled by adding the acid directly to the salt, corking the bottle for a while before adding water, so as to make a solution of chlorine in water.

Chlorate of potassium with syrup of iodide of iron liberates *free iodine* which has proved fatal.

11. **Cocaine** in solution requires the addition of a little salicylic acid to prevent fungus growth.

12. **Cod-liver Oil** is well emulsified by the following method:—Place powdered tragacanth in a dry mortar and triturate with a little of the oil, then add the yolk of an egg and the oil and stir briskly, adding water as the mixture thickens, and lastly mix flavouring oils and water alternately, with constant stirring, avoiding frothing. The mixing of limewater 1 to 5 with cod-liver oil greatly facilitates its emulsification, and reduces its tendency to cause eructations. Lime-water and acacia gum emulsify cod liver oil just as well as the yolk of egg.

13. **Copaiba Balsam** can be well emulsified by rubbing it with one-third its weight of milk sugar, and about its own weight of powdered gum acacia, adding water gradually. Liq. potasse also emulsifies it well.

14. **Ethers** should never be mixed with hot liquids, and must be added last to a mixture.

15. **Ferri Sulph.** soon gives a rusty colour to a solution from the production of ferric hydroxide, which is retarded by adding an acid.

16. **Glycerin** is used as a sweetening agent for mixtures, especially those that contain perchloride of iron. It is also used as an appropriate solvent for, and a preservative of, the pancreatic and peptic ferments. It prevents gelatinisation of kmo in Tr. kmo, and also to a certain extent prevents and retards chemical changes and precipitation in a mixture.

17. **Iodine** is very sparingly soluble in water, but iodide of potassium helps solution to the extent of three-quarters of its own weight. Salts of ammonia also increase its solubility by the formation of a soluble salt ammonium iodide. Some essential oils, such as oils of peppermint and fennel, chemically combine with iodine. Strong solution of iodine with solution of ammonia, or with ammoniated camphor liniment, precipitates iodide of nitrogen, which is a most dangerous explosive. (*See Explosive Combinations.*)

18. **Morphine Salts** should not be dissolved by heat, for at a temperature above 104° F. their solutions turn yellow or brown.

19. **Phenazone** is sometimes a troublesome drug to deal with in a mixture. It is rather a free base, and gives precipitates with tannin, alkaloids and many other substances. Thus, with alkaline salicylates,

it forms *salipyrin* (insoluble) ; with ferric chloride *ferripyryn* (orange-red) ; with free iodine *iodopyryn* (insoluble) ; with chloral hydrate *hypnal* (insoluble), &c.

20. **Potassium Iodide** is decomposed by acids, liberating *free iodine*, which may produce fatal results. This also happens when potassium iodide is mixed with tincture of perchloride of iron.

21. **Quinine Salts.** The following points in respect of the mixing of a quinine salt should be noted :—

(a) It produces an *insoluble salt* when added to a strong mineral acid ; the acid should be freely diluted with the vehicle before the alkaloidal salt is mixed.

(b) When it is prescribed with spirit of nitrous ether, tinctures, ether, or any spirituous liquids along with glycerin or syrup and water, the quinine is to be first dissolved in the undiluted spirituous mixture and then glycerin or syrup added, and lastly the vehicle is gradually mixed. If no mucilage is ordered it may be added, to prevent quinine from adhering to the sides of the bottle.

(c) The sulphate should not be dissolved in diluted hydrochloric or nitro-hydrochloric acids unless so ordered.

(d) When ordered with bark or any other substances containing tannic acid, it deposits a precipitate of tannate of quinine which should not be filtered.

(e) No acid should be added by the dispenser to make a solution if it is not prescribed. The quinine is then to be rubbed up in a mortar with a little mucilage and diffused in water, or added to the vehicle in its crystalline state, with "shake the bottle" as a direction. The former is the better method.

(f) Quinine salts are *incompatible with alkalis*, such as bicarbonates, carbonates, hydrates, spirit, ammon. aromat. &c. They should be suspended and diluted *separately* before mixing, a small quantity of mucilage will make a better mixture.

(g) Ammoniated tincture of quinine gives a precipitate when diluted with water, but the addition of a little mucilage ($\frac{1}{2}$ dr. to 1 oz. of mixture) suspends it.

(h) With liberated chlorine, quinine salts yield a yellow solution, *i.e.* when added to the chlorine mixture mentioned in para. 10, page 82.

(i) Mercuric chloride throws down a poisonous precipitate, which can be dissolved by diluted hydrochloric acid. Glycerin and gum also retard to some extent chemical reaction.

(j) Donovan's solution too, behaves in the same way, but an admixture of glycerin and mucilage prevents to some extent chemical changes.

(k) When it is ordered with saleylates in a mixture, an ugly-looking mass, saleylate of quinine, forms inside the bottle and refuses to flow out. The mixture may be improved by rubbing mucilage with quinine and gradually mixing the saleylate dissolved in a large quantity of water, and agitating very briskly.

(7) Neutral solution of quinine and iodide of potassium do not react chemically, unless there is an acid present, free or liberated, in which case iodine is set free.

(m) The growth of fungus in a solution of quinine is prevented by the addition of a 5 per cent. solution of alcohol or a trace of chloroform.

22. **Spirit of Nitrous Ether** soon turns *acid* (HNO_3) from decomposition, and should therefore be made *alkaline* before being mixed with iodides, or bromides, otherwise free iodine or bromine will be liberated and will darken the mixture. It can be kept permanently alkaline or neutral by dropping a few crystals of potassium bicarbonate in it.

Spt. Æther. Nitrosi should be kept in an amber-coloured bottle (blue or green is useless) in the dark, for daylight decomposes it.

23 **Salol** when combined with other salts in a mixture falls to the bottom in a somewhat granular form; this is prevented by adding mucilage in the proportion of 13 to 1.

24 **Strychnine** in a mixture containing alkalis is precipitated to the bottom of the vial, and fatal results may follow the swallowing of an overdose. Bromide and iodide of potassium, Liq. Hydrargyri Perchloridi and Liq. Sodii Arsenatis all throw down insoluble precipitates of strychnine compounds.

25. **Tannic acid** should be dissolved in pure distilled water, as tap water makes the solution opalescent. It precipitates alkaloids in solution and gives with iron an inky colour. Alkalis give precipitates, and turn the mixture brown to black. Mucilage makes it flaky.

26 **Terebene and Turpentine** are best emulsified with the yolk of egg. At least one egg is required for each ounce of oil of turpentine. Thick mucilage and Tr. Quillare answer fairly well, but are not so good as the yolk of egg.

27. **Vegetable extracts** should be carefully *rubbed* in a warm mortar with a little water till a soft paste is obtained, with which the vehicle is to be gradually mixed. If they are resinous rub them with two or three times their weight of powdered acacia in warm water, and then gradually mix with the vehicle when cold. *Ext. Filicis Liquid* may be triturated with powdered acacia, soap or milk.

PILLS

1. **In making a pill-mass**, the following points should be observed :—

(a) Put the substance (powder) prescribed in smallest quantity into the mortar first, and triturate it with the next smallest (if it is powder), add the next, again triturate, and so on.

(b) Toxic substances (*e.g.* alkaloids and arsenic) should always be triturated well with double their weight of a hard powder (*e.g.* sacch.

lactis), if there is none in the pill constituents, before adding the other ingredients gradually.

(c) Potent extracts which are prescribed in the pill should not be treated as excipients, *e.g.* Extr. Nucis Vom. gr. $\frac{1}{2}$ with Pulv. Aloes gr. $\frac{1}{2}$ and Pulv. Ipecac. gr. ss. Here rub the extract with the ipecacuanha, add a little of the aloes, again triturate, and continue thus until the extract is equally divided throughout the whole.

(d) Essential oils should be treated like No. (c). Thus in the case of Pil. Aloes Socot., the oil of nutmeg should be triturated lightly with the powdered soap (the oil being added gradually), then aloes, trituration, aloes, trituration, &c.*

2. The official pill-masses:—The following can be conveniently and usefully kept in powder, *viz.* —Extr. Colocynth. Co., Extr. Rhei, Pil. Aloes et Ferri, Pil. Aloes et Myrrh, Pil. Aloes et Asafetida, Pil. Cambog. Co., Pil. Colocynth. Co., Pil. Hydrarg. Subchlorid. Co., &c., noting on the label of each the quantity of the powder that is equivalent to the pill-mass. Thus, Pulv. pro-Aloes et Asafetida gr. $\frac{1}{2}$ 5 grs. Pil. Aloes et Asafetida.

3. Pills under one grain should be made up to 1 grain by the addition of liquorice powder or sugar of milk. Fractions of a grain of such **powerful drugs** as strychnine, perchloride of mercury, sulphide of calcium, arsenic, &c., should be intimately triturated with crystallized sugar of milk, and then made into a pill-mass with soft manna, or other suitable excipients. For calculation of fractional weights, *see* p. 77.

4. Pills liable to crumble will keep their shape for a reasonable time if some fibrous materials, such as liquorice powder, paper pulp or lycopodium are added to the mass. If the pill mass is too soft, it should be hardened on a hot plate, but if the ingredients are hard and brittle, such as pitch, Chian turpentine, &c., they should be massed in a warm mortar. When the pill-mass contains dry vegetable powders, some minutes must be allowed for the absorption of moisture before rolling.

5. The same spatula should never be dipped into the extract pot after it has been used to scrape the pill mass from the tile, pestle and mortar.

6. To prevent sticking together, cinnamon or liquorice powder, mixture of starches, powdered French chalk are used. Pills containing hygroscopic and volatile ingredients should be varnished or coated and then dispensed in a well stoppered or corked bottle. Pills for silvering should never contain glycerin.

7. Substances that are decomposed by Iron, such as silver nitrate, copper and bismuth salts, corrosive sublimate, and calomel, ought not to be mixed in an iron mortar, or scraped by an iron spatula.

8. Crystalline salts soluble in water should be very finely powdered, and massed with theriacanth and some inert powder.

* Chemists' and Druggists' Diary 1898.

Before silvering, they must be varnished with tolu and dried. Glycerin of tragacanth is the best excipient for insoluble salts.

9. **Essential oils.**—Soap or sometimes soap and powdered liquorice root make a good excipient. Wax is to be avoided. When there is much essential oil, the addition of liquor potasse helps greatly.

10. **Potent Drugs.**—*To diffuse* potent drugs as aconitine, atropine or strychnine, add a minute quantity of glycerin before massing.

11. **Scale preparations** should be finely powdered with a palette knife instead of triturating in a mortar before massing. Mauna is a good excipient for such substances.

EXCIPIENTS

An excipient is a substance either solid or liquid added to bind the ingredients of a pill-mass into a plastic and adhesive mass.

1. **Acacia** in powder is not a good excipient, though frequently used. It makes the pills too hard. With calomel it forms a regular cement.

2. **Bread crumb** has fallen into disfavour. When mica panis is ordered, use wheaten flour and water *q.s.*

3. **Calcium Phosphate** in minute quantities gives a pillular consistence to greasy substances and essential oils. It is a good desiccant.

4. **Castor Oil** with or without soap is a good excipient for making camphor pills.

5. **Confections of Roses and Hips** are not used now, because they increase the bulk of pills.

6. **Compound Decoction of Aloes** in minute quantities is a good excipient for pills containing aloes and gum resins. It should not be used where there is an incompatibility with carbonate of potassium.

7. **Extract of Malt** is a good general excipient.

8. **Glycerin** keeps pills soft, but it is very hygroscopic. The addition of one-third of its weight of water overcomes its hygroscopic property.

9. **Glycerin, Mucilage of Acacia, Water, and Alcohol** in equal parts make a good general excipient.

10. **Glucanth** as prepared by Lucas, consists of powdered tragacanth $\frac{1}{2}$ oz., glycerin $1\frac{1}{2}$ oz., water $\frac{1}{2}$ oz., syrup of glucose $3\frac{1}{2}$ ozs. It is useful where glycerin of tragacanth is unsuitable on account of the large quantity of glycerin.

11. **Glucose Syrup**, or glucose 12, glycerin 4, water 1, by weight is a serviceable excipient.

12. **Honey and Treacle** do not make the pills hard, and are at times used in preference to mucilage, &c.

13. **Kaolin** is useful for massing oxidizable and reducible ingredients, as potassium permanganate.

14. **Kieselguhr** (fossil earth) absorbs liquids (1 gr. = 1 m.) The mixture can be massed by glucanth.

15. **Lanoline** may be used in massing certain scale preparations. Being non-oxidizable it may be used to mass Pot. Permanganas or Argenti Nitras with prepared kaolin.

16. **Liquorice and Marshmallow** in powder are absorbent and give elasticity to the soft mass.

17. **Manna** can be used for massing calomel, quinine, and bismuth salts.

18. **Proctor's Paste** consists of Pulv. Tragacanth (1 dr., glycerin 3 drs., and water 1½ dr. The paste improves by keeping. The B.P. Glycerinum Tragacanthæ may be used as a substitute. It is an all-round good excipient.

19. **Resin Ointment** is used for scale preparations.

20. **Soap Powder** is the best excipient for vegetable powders, extracts and gum resins. It neither hardens nor crumbles. It should not be used for masses containing acids, acid salts, metallic salts, and substances containing tannin.

21. **Syrup** alone is rarely used, but makes a useful excipient with powdered althea.

22. **Spirit** softens resinous substances, but the mass should be quickly rolled, otherwise it will crumble.

23. **Theriacaanth** is an admirable excipient for intractable drugs, as reduced iron, phosphate of iron. It is made by rubbing Pulv. Tragacanth, 1 dr. with rectified spirit 2 drs. and mixing quickly with warm treacle 2 ozs.

24. **Tincture of Gentian and Treacle** in equal parts make a good excipient, giving firmness, toughness, and solubility. It is recommended by Dr. Whittle for massing quinine.

25. **Tragacanth** powder gives in small quantities solidity and elasticity to a soft mass; more so when the compound powder is used.

26. **Water** should be used with caution. It is a good excipient for masses containing gum or soap and makes a good pill with powdered opium.

27. **Wax** is not much used now, for it makes pills indigestible, though it makes a beautiful pill-mass with camphor, creosote, carbolic acid, and most of the essential oils. Cacao butter makes a good mass with silver oxide.

28. **Ince's Precautions.** The excipients to be avoided are:—

(a) Those incompatible with any of the ingredients of the pill mass. Thus, confection of roses must not be used to make up iron compounds, acetic extract of colchicum must not be stiffened with magnesia.

(b) Those which make the pill either too hard or too soft.

(c) Those which unduly increase size.

PILLS OF SPECIAL DRUGS

1. **Acids.** Mineral acids are rarely used in pills, but the addition of powdered marshmallow and glycerinated water makes a good pill-mass.

2. **Aloes** is best made into pills, with a minute quantity of compound decoction of aloes, which has a great solvent power, or with proof spirit. **Aloin** is massed with glycerin of tragacanth.

3. **Antipyrin** makes a good pill with tragacanth or glucanth.

4. **Argenti Nitras** and **Argenti Oxidum**.—The former is triturated with kaolin and massed with paraffin ointment, the latter with kaolin ointment.

5. **Bismuth Salts** are best made into pills with Proctor's paste or manna.

6. **Butyl Chloral Hydrate** makes a good pill-mass with equal parts powdered acacia, tragacanth and syrup.

7. **Calcium Sulphide** should be triturated with $\frac{1}{2}$ gr. of sugar of milk for each pill, and massed with powdered tragacanth and glycerin. Each pill should be of 1 gr. gross weight.

8. **Calomel** with manna makes a good pill.

9. **Camphor** should be powdered first with a few drops of alcohol, and after the evaporation of the spirit, Proctor's paste is to be added. Some like soap and fixed oil.

10. **Camphor Monobromata** should be triturated with Pulv. Tragacanth Co. and massed with Proctor's paste.

11. **Carbolic Acid** (crystallized) is massed with wheaten flour, powdered soap and liquorice, or powdered marshmallow with a minute quantity of Proctor's paste.

12. **Citrate of Iron and Quinine** can be made into a pill by the addition of proof and rectified spirit and rolling the mass quickly. Resin ointment can also be used.

13. **Codeine** can be massed with half its weight of powdered liquorice and glycerin of tragacanth.

14. **Copaiba** when massed with carbonate of magnesia, make a very hard pill which is insoluble in the intestinal secretions. If it be made into an emulsion with gum and be set aside for twelve hours, after adding 1 part of magnesia levis to every 10 parts of the Balsam, it may be converted into a good pill mass by the addition of a minute quantity of borax, and such a pill is soluble. Phosphate of calcium also makes a good pill.

15. **Creosote** with powdered curd soap B.P. and powdered liquorice make a good mass. The following method is recommended by Martindale: "Put the creosote in a wide-mouthed stoppered bottle, add the soap, and mix well. Then digest in a water-bath till they combine." **Guaiacol** should be treated like creosote.

16. **Croton oil** forms a good pill-mass with wheaten flour, mucilage and liquorice powder, or powdered curd soap with a little glycerin of tragacanth.

17. **Ergotin** makes a good pill with powdered althea or any inert vegetable powder, and sometimes with a minute quantity of tragacanth. It must be hardened by evaporation if too soft.

18. **Ferri Sulphas**.—The granular sulphate forms a good pill with glycerin of tragacanth and a little powdered sugar of milk. **Ferri**

sulph. exsicc. does not make a good pill. It cracks after a while. However, the following method may be tried :—The iron salt is to be triturated with equal parts of powdered acacia and tragacanth and massed with a mixture of glycerin 1 and water 2.

19. **Ferrum Redactum** makes a good pill, when rubbed down to a fine powder, powdered liquorice added, and massed with liquid glucose or glycerin of tragacanth. Theriacanth makes an excellent excipient. Extracts may swell the pills from the production of hydrogen, if they turn acid.

20. **Gallic Acid and tannic acid** make a good pill-mass with glycerin. (4 gr. with $\frac{1}{2}$ m.)

21. **Hydrargyrum c. Creta** can be massed with glycerin of tragacanth. It should never be vigorously triturated in a mortar, as mercury may separate.

22. **Hydrargyri Perchloridum** should be finely triturated with sugar of milk and made into a pill with glycerin of tragacanth.

23. **Hydrargyri Subchloridum** makes a good pill with manna.

24. **Menthol** should be worked like carbolic acid. If it liquefies during manipulation, add kieselguhr.

25. **Pepsin** can be massed with a mixture of equal parts of glycerin, syrup and water by quick rolling. 1 m. of diluted hydrochloric acid and 5 grs. of pepsin can be rolled into a pill.

26. **Phosphorus** can be made into pills by three methods :—

(a) *Solution by Carbon Bisulphide*—Phosphorus is first dissolved in bisulphide of carbon, and while the solution is going on pour in two or three drops of chloroform, which gives rise to a thick vapour around the solution, and thus prevents ignition. A little powdered liquorice is now added and a workable mass is made by the addition of a little of Proctor's paste. (b) *Solution by Oil*—Phosphorus is melted in hot mutton suet or oil of theobroma, in a wide-mouthed bottle with an india rubber cork, and well shaken till the fat solidifies. Then add liquorice powder and make a plastic mass. (c) *Combined method or the B.P. Process*—In this, phosphorus is dissolved in carbon bisulphide and the solution is carefully mixed with melted lard and beeswax, and made into a pill-mass with the addition of a little kaolin. The last method is better suited for India. The mass must be kept immersed in cold water in a blue bottle away from light. 3 grs. of the mass and 1 gr. of acacia powder can be rolled into a pill for dispensing.

Pills containing phosphorus require varnishing or a pearl coating.

27. **Potassium Acetate** is rarely used as a pill. Canada balsam makes a far mass, but boro-tartrate of potash, a scale compound, makes a better one.

28. **Potassium Iodide** must first be rubbed up with a little water, so as to make a thick paste, before liquorice powder is added.

29. **Potassium Permanganate** requires careful treatment, for it soon oxidizes when brought in contact with organic matter, such as sugar, syrup, glycerin, vegetable extracts, &c. It can be made into a good pill-mass by mixing it with kaolin and a little water, or with Martindale's *kaolin ointment* which consists of equal parts of vascline, paraffin and kaolin.

30. **Quinine Sulphate** with tartaric or citric acid makes an excellent mass. Sometimes a drop or two of glycerin or water may be necessary in dry weather. The pills must be varnished or capsuled, otherwise they will become soft and sticky by damp. Glycerin of tragacanth, manna and strong sulphuric acid (1 drop to 4 grs.) are also good excipients. White excipients should be used for white drugs.

31. **Rhubarb Powder** is a troublesome substance for pill-making. Proof spirit or tincture of rhubarb (1 in. to 3 grs.) makes a soft mass which should be rolled quickly. Simple syrup, treacle and equal parts of glycerin and rectified spirit may also be used.

32. **Salol** can be made into a pill with glucanth.

33. **Taraxacum Extract** causes fermentation and thereby swelling of pills. It should be mixed with powdered tragacanth after evaporation. Pills should stand for half an hour before silvering.

34. **Zinc Valerianate** makes a good mass with a little powdered acacia and spirit. Glycerin of tragacanth and liquorice powder may answer well.

PILL COATING

1. **The general rule** in the coating of pills is that *all pills requiring a coating should be perfectly made, of a firm consistence, and free from contamination and powder.*

2. **Silvering** is done in a covered earthenware pot or a boxwood pill silverer. The pills being dampened with thin mucilage are dropped on to a silver leaf put within the silverer. The cover is then put on and the silverer is shaken for about a minute. After the superfluous fragments of silver-leaf have been blown off, the pills are exposed to air for a few minutes to dry. One silver leaf covers six 5 gr. pills, and two drops of mucilage are enough to damp a dozen of such pills. When the pills are too damp, more leaf is required for silvering, moreover the finish is not so elegant. A better and finer silvering can be obtained by putting the pills and leaf in a covered porcelain pot or a metallic silverer, heating the pot or silverer over a spirit lamp and rotating it as before.

Pills containing asafetida and sulphides should not be silvered unless they are very *stiff* and *varnished*, otherwise the silvering will soon get blackened. Pills containing mercury produce an unsightly amalgam.

3. **Varnishing** can be done either by a solution made by dissolving 1 of residue of tolu syrup known as "spent tolu" in 3 of pure chloro

form or ether, or by a solution (Martindale's) containing equal parts of sandarach and absolute alcohol. The pills being put in a smoothly glazed covered pot, enough of the varnishing fluid is added to wet them all, and the pot rotated as in silvering. They are then transferred to a developing dish, separated from one another, and occasionally rotated until the coating dries and becomes hard. The chloroform or ether solution dries very soon.

4. **Gelatin-Coating.** - A coating solution is made by dissolving 1 of gelatin in 4 of water on a water-bath, straining while hot, and cooling it afterwards. If there are air bubbles, the solution should be reheated. The pills are now stuck on the points of pins or needles and dipped into the warm solution. The needles are taken out slowly and rotated for a few seconds, and then stuck into a sheet of cork or pin-cushion by their opposite ends. As soon as the outside coating dries, the needles are withdrawn, and the holes close of themselves.

5. **Pearl-Coating** is very popular now. For a perfect and elegant coating pills must be completely dry, which can be easily accomplished by keeping them in a sulphuric acid drier. If they contain any hygroscopic substances, they should be varnished before coating. Generally two kinds of solution are used (a) one which contains mucilage 1 dr., syrup 1 dr. and water to 1 oz. ; and (b) another (Martindale's) which contains syrup $\frac{1}{2}$ dr., tragacanth 1 grs. and water to 1 oz. A few drops of either of these are poured over the pills in a covered globe or pill-coater, which is rotated in order to damp them, as well as to moisten the inside surface of the globe. Exceedingly fine, powdered French chalk, which can be improved by adding 3 p.c. of mag. carb. levis in order to help their solubility in the gastric juice, is dusted over the pills from time to time as the rotation is continued, until the coating is uniform. The pills are then transferred to a second clean globe and rotated rapidly until they are polished. If a high polish is desired, the burnished pills can be rotated in a third warmed globe having a thin coating of hard paraffin or white beeswax.

6. **Sugar-Coating** is rather a complicated process. Dr. Symes recommends the following as the most practical method : - " Pills well dried on the surface are placed in a tinned copper bowl with a flat bottom, or an enamelled iron dish, the surface of which has been moistened with syrup, or syrup and gum. They are then rotated and gently heated, very finely powdered sugar being dusted on, and the motion kept up till a perfectly dry, hard, and whitish coating is obtained, the operation being repeated if necessary."

7. **Keratin-Coating.** - Keratin solution is made by first removing from horn shavings all that is soluble in pepsin and diluted hydrochloric acid, dissolving the residue in alcoholic solution of ammonia or acetic acid, and then evaporating the solution to the consistence of a liquid gum. The pills are simply rotated with this solution in a pot and dried on a slab. The coating often gets sticky. Pepsinized keratin

can be bought and dissolved in any of the above solvents. Drugs intended to pass undissolved through the stomach are coated with keratin or salol; as carbolic acid.

8. **Salol-Varnishing.**—The varnish contains salol 2, shellac 3, absolute alcohol and ether of each 3, and should be applied several times till a thick coating is obtained. Or salol can be melted by heat in a copper bowl and the pills rotated as in sugar-coating.

POWDERS

1. **Compound Powders.**—The B.P. gives no directions as to the manner of mixing compound powders, consequently the dispenser is left to his own experience and resources in compounding them. The following hints, however, will greatly help him.

(a) **Powders must be thoroughly mixed** in a mortar or on paper. Powders mixed by a spatula on paper and sifted are more diffusible in water than those rubbed up in a mortar; but there are exceptions to this rule. Take for example the following prescription —R Sulph. Precipit. gr. xx, Guaiaci Resin gr. x, Magnesia gr. xx. Here the most miscible powder is obtained by triturating guaiacum and magnesia together in a mortar, before adding sulphur, whereas if mixed on paper, it would not diffuse in water. Powders for insufflation should never be triturated in a mortar, but only loosely mixed on paper.

(b) They should be **passed and repassed through a fine hair sieve** as often as possible. By repeated sifting and shaking in a bottle, the ingredients are thoroughly incorporated and a uniformity of colour is obtained.

(c) They should be **very lightly rubbed** in a mortar if this process is at all adopted, otherwise they would cake.

(d) **Ingredients in smaller quantities** should first be thoroughly mixed together, and afterwards larger quantities be gradually incorporated.

2. **Folding Paper and Boxes.**—Powders should be folded in ordinary writing paper, or better if possible, in demy glazed powder-paper made for the purpose. Waxed or paraffined paper is to be used for hygroscopic drugs. Coloured paper is used for powders for lotions. Folded powders should be of the same breadth and length, better done on a powder-folder. Powders under six are generally dispensed in a neat small oblong envelope on which "The Powder" is printed; but those over six in a cardboard box or bottle with a label gummed outside.

3. **Waxed Paper and Tinfoil.**—Drugs that are **perishable**, as ergot; that are **volatile**, as camphor, essential oils; that are **hygroscopic**, as potassium acetate, carbonate and citrate, and sodium

iodide, &c. ; that are liable to **decomposition**, as calcium sulphide, valerianates, should be folded first in waxed paper, and then each covered with tinfoil and dispensed in a bottle.

4. **Powders in Quantity**.—When a powder is ordered to be given in spoonfuls, it should be dispensed in a well-corked or stoppered, wide-mouthed bottle.

5. **Salts** which mutually decompose each other must be mixed and stirred lightly together in a dry condition ; as sodium sulphate with potassium tartrate, potassium nitrate with sodium salicylate, &c.

6. **Oxidising Substances** should be each separately rubbed to powder, and then lightly blended on paper with safe ingredients by a bone spatula. (*See Explosive Combinations.*)

7. **Hygroscopic Powdered Drugs** should never be kept in paper packets. They should be dried and preserved in wide-mouthed bottles or stone jars with accurately fitted stoppers or corks. Suspending a bag of dry quicklime from the cork helps also to keep powders dry. Powdered squill and ammoniacum can be kept dry in this way.

8. **Removal of Identity**.—Crystalline salts, as potassium bromide ; roots, as ipsecacuanha ; leaves, as digitalis ; barks, as cinchona, &c., should be finely pulverized before admixture.

9. **Division of Powders**.—There should be no guesswork in division. **Each one must be weighed**. Many failures in examination are due to inattention to this simple procedure.

10. **Liquids** are rarely prescribed in powders ; if so, white kieselguhr may be used to absorb them (1 gr. to 1 m.).

BLISTERS

1. **Blister Spreading**.—A blister is best spread over an adhesive plaster, which has been previously spread upon glazed thin calico. First of all the dispenser should cut a “shape”—an exact size and form of the blister ordered—out of a square piece of writing or packing paper, leaving all round a margin 1 inch wide. This is best done by folding the square piece twice upon itself, and cutting by a pair of scissors the shape of the blister out of the middle, rejecting the cut out central piece. *This empty space is the shape of the blister.* The dispenser now cuts a piece of spread adhesive plaster or adhesive plaster-mull one inch bigger than the size ordered, and gently warms it to make it slightly sticky, and quickly lays the “shape” upon its sticky surface, and evenly presses it down. (In India the warming of the adhesive plaster is not often necessary during hot months.) He then takes a quantity of the B.P. cantharides plaster sufficient for the size and softens it well between his thumb and fingers. Taking a small pellet, he spreads over the adhesive surface, with the side and

front of his right thumb, while the fingers of his left hand keep the plaster *in situ*. He goes on making a series of rainbow-like strokes from left to right till the whole of the surface within the shape is covered. A long spatula not unlike a large dinner knife is gently warmed, and firmly passed over the spread cantharides, removing any superfluous plaster and making its surface smooth. The paper shape is now removed, and the edges are neatly trimmed, keeping a margin of the plaster three-eighths of an inch wide. A piece of oiled or waxed paper is now loosely laid over the blister and the whole put within a paper box.

2. **Powdered Cantharides, Blistering Liquid or Olive Oil** should not be sprinkled or applied to increase the action or improve the appearance of the blister.

3. **Paper-Covering** should be removed before use, otherwise the blister will not stick. Both the dispenser and prescriber should give directions to this effect. A better plan is to pin the margins to a piece of paper which is then stuck to the bottom of the box.

PLASTERS

Most of the plaster-mulls of the market are made by machinery. Dispensing of such a spread plaster means the cutting of a piece ordered. It is only when a special plaster is ordered that the dispenser is required to make one on the counter. The spreading of a plaster requires great skill and dexterity.

1. **Plaster Spreading.**—A plaster is made in the same manner as a blister, except that the method of spreading is different. Sheepskin, stiff chamois, dimity, moleskin or sometimes adhesive plaster-mull is used, but the white sheepskin is generally preferred when not otherwise ordered by the prescriber. The "shape" is cut in the same way as for a blister. A piece of leather larger than the size of the plaster ordered, is cut off, and stretched out in all directions by pulling. The leather is now placed with its rough surface upwards on a thick pad of paper, and the gently warmed plaster iron is passed over it, to remove any wrinkles or inequalities. The paper shape merely dipped in water is evenly pressed against this rough surface, and all the necessary appliances being in readiness the process of spreading is begun, in one or other of the following ways :—

(a) **Modern Method.**—The plaster is cut into thin slices, put in a small enamelled pan with a lip and handle, and warmed over a gas flame or fire, stirring it constantly and not allowing it to boil. In the meantime, the leather, the shape, and the plaster iron or spatula are kept ready as already described. As soon as the plaster becomes creamy, it is poured over the leather within the shape at the left end, then with a long spatula or plaster iron it is spread rapidly over the

surface, any superfluous plaster being removed and returned to the pot.

(b) **The Writer's Method.**—The easiest and most convenient method of spreading is to cut a piece of plaster from the stick, allowing 15 grs. for each square inch of plaster required, and to put it on a sheet of strong, smooth, brown paper. Having prepared the shape and the leather, melt the cut-off piece to a creamy consistence by gently rubbing a hot plaster iron over it, and scrape the mass to the edge of the paper. The leather with the shape, having been brought alongside, with one or two sweeps the dispenser covers the whole surface, removing any superfluous plaster with a spatula. A second hot iron may be required at this stage.

A mixture of plasters can be made by a similar process.

2. **Plaster with an Adhesive Margin** is made in the following manner:—The shape is cut as before, and the central piece instead of being thrown away, is damped and stuck to the middle of the leather. The shape is again folded up, and a piece of the width of the intended adhesive margin is cut off; and the shape is pressed against the leather, thus leaving a free space between the centre-piece and the shape; which space is now covered over with the adhesive plaster. When cold remove both the papers, and apply a second shape cut to the proper size, having previously coated it lightly with soft soap to prevent it from sticking to the adhesive margin. The plaster is now spread in the ordinary way, the shape removed, and any soap that may have adhered to the margin is wiped away with a wet cloth or sponge.

The Writer's Method.—The plaster is spread as usual and the shape is pulled off, and the margin of the leather is trimmed, leaving exactly the width to be covered over with the adhesive plaster. The dispenser now melts a small piece of adhesive plaster in a gallipot, and with a spatula spreads it over the margin and finally smooths it by passing a hot spatula over. The advantage over the other methods is its simplicity, for it is more easy to cover the margin last, than to cover the central part after the margin has been covered.

3. **Plasters for bed-sores** are spread on chamois leather without margins.

4. **Mammary plasters** must be circular in shape, 7 in. in diameter, with an opening 4 in. in diameter in the centre. The margin is to be notched to fit these plasters to the curved surface of the breasts.

SUPPOSITORIES, PESSARIES AND BOUGIES

1. **Basis.**—Oil of theobroma is the *official basis*. It should be liquefied on a water-bath in a casserole or a porcelain evaporating dish. In India and the Colonies, where the prevailing temperatures

are higher than in England, a sufficiency of white beeswax may be added to raise the melting-point to the necessary degree. *Gelatin basis* (Squire's) is made by soaking gelatin 1 oz. in water 1 oz. until absorbed, and then dissolving in glycerin $3\frac{1}{2}$ ozs. on a water-bath. This can be kept ready made, covered by a layer of alcohol, in a wide-mouthed bottle. The relative proportions can be altered as required. Gelatin basis is used for making nasal bougies, uterine pessaries and suppositories.

2. **Ingredients** should be treated like those for ointments. Any powder or crystalline substance must be rubbed very fine with a little cacao butter, before mixing with the melted oil of theobroma.

3. **Moulds** must be perfectly clean and cooled with ice or cold water, and the inside surface wiped with a bit of rag or lint soaked with soap liniment. Wiping with almond oil is necessary for gelatin suppositories.

4. **Operations.**—Triturate as in para. 2, and mix with the melted oil of theobroma with constant stirring, until a creamy mass without lumps is obtained, and then pour it into the moulds, or divide into equal parts when hard, and mould them with your fingers into the shapes of suppositories, pessaries and bougies. Finely powdered starch prevents them from sticking during manipulation.

SUPPOSITORIES AND BOUGIES OF SPECIAL DRUGS

1. **Alkaloids.**—Alkaloidal salts are generally better absorbed than pure alkaloids, and therefore the salts instead of the alkaloids should be used dissolved in oleic acid.

2. **Aristol** makes very good bougies with cacao butter by the cold process.

3. **Boric Acid** makes a good mass, if Glycer. Acid. Boric. B.P. and gelatin basis are mixed together.

4. **Chloral Hydrate** should not be mixed with heated cacao butter, but rubbed up with cold cacao butter and a little wax, if necessary, and pressed into the mould.

5. **Extracts** must be made into a smooth paste with water or proof spirit, and gradually mixed with the melted basis. **Ergotin** must be treated similarly.

6. **Hamamelis** suppositories are made of liquid extract of hamamelis evaporated to one-half (5 ms. for each). Hamamelin or hamamelidin too (1 to 3 grs.) with cacao butter makes a good suppository.

7. **Ichthyol** should not be worked up with gelatin basis which makes it insoluble. Use cacao butter and add 1 gr. of beeswax to give it firmness.

8. **Iodoform** makes good bougies and suppositories with cacao butter by the cold process.

9. **Despatching**.—These preparations should be sent out wrapped in absorbent cotton-wool. In hot weather, they may be dispensed in a wide mouth stoppered bottle containing iced water. If they contain volatile ingredients, each of them should be covered with waxed paper or tinfoil.

SYRUPS

1. **Ingredients**.—Refined or unfaced cane sugar and distilled water should alone be used in the preparation of syrups. If any scum rises during boiling, it should be skimmed off. The quantities must be exact, otherwise either crystallization or fermentation may occur.

2. **Straining**.—Syrups are to be strained through a felt bag, and carefully stored away in well-stoppered or corked bottles in the dark.

3. **Fermentation**.—Care should be taken that no admixture of water or other fluids occurs, otherwise they will ferment and decompose.

4. **Syrups containing organic fluids** like the majority of the B.P. ones, keep better and longer if they are despumated. **Concentrated liquors** of standard strength may be used for any organic syrups that are liable to decompose on keeping.

5. **Syrupus Ferri Iodidi** requires boiling, so as to convert a portion of the sugar into glucose, with a view to preserve ferrous iodide in its pristine condition; but pharmacists generally fail to do so. It is now, therefore, largely prepared from the **liquor**, which keeps bright and without oxidation indefinitely by the addition of a trace of hypophosphorous acid.

6. **Syrupus Ferri Phosphatis** darkens by keeping, but can be extemporaneously prepared from a concentrated solution of iron in phosphoric acid, by addition of simple syrup.

7. **Easton's Syrup** darkens also by keeping, but a clear syrup may be made at any time by mixing 1 part of liquor ferri phosph. with 7 of a syrup containing the other ingredients.

TINCTURES

In the preparation of tinctures three things are essential, *viz.*—(1) the **Solvent**, (2) the **Process**, and (3) the **Ingredient**.

1. **Solvent**.—The new B.P. has dispensed with the use of rectified and proof spirits, and in their stead has sanctioned alcohols of various strengths, making absolute alcohol the standard unit (*see p. 52*).

(a) *Alcohols of higher strengths* are used (1) for the abstraction of *alkaloidal principles*, as of aconite, strophanthus, &c.; (2) for the solution of *resinous*

substances, as asafetida, benzoin, myrrh, Indian hemp, &c.; (3) for the solution of volatile oils, as cubebs, lavender, orange peel, &c.; and (4) for the solution of inorganic substances, as iodine, ferric chloride.

(b) *Ammonia along with alcohol* is used in the preparation of ammoniated tinctures of ergot, guaiacum, opium, quinine, and valerian.

(c) *Spiritus Ætheris* is the menstruum for *Tr. Lobeliæ Æthereæ*.

(d) *Tr. Aurantii* is for *Tr. Quininae*.

(e) *Glycerin, Chloroform, and Distilled Water* are used for dissolving gummy, juicy, resinous, extractive, saline, metallic, non-metallic and alkaloidal drugs.

2. Process.—Any of the following processes is used for making tinctures.

(a) *Solution.*—Alcohol is the principal solvent. Next to it is water. The necessary conditions for promoting a perfect solution are:—

(1) The solute should, if possible, be comminuted to allow a large area for action by the solvent.

(2) Agitation must be continued, or the solvent passed and repassed through the solute, or the solute suspended in the solvent.

(3) Heat should, if necessary, be applied to expedite the solution.

(4) Stirring is necessary for dissolving a solid. Glass mortars should not be used if not annealed, as they may crack, from increase and decrease of temperature.

(b) *Maceration* is not considered as suitable or economical as percolation, because it requires seven days' operation. But, if the ingredients are uniformly comminuted and soaked in the menstruum with frequent shaking, an efficient tincture can be obtained after five days. The B.P. process is to strain the tincture, press the marc, mix the strained and expressed fluids, filter, and add more menstruum to bring up the tincture to the prescribed volume.

(c) *Percolation.*—Moisten the ingredients with the prescribed amount of the menstruum and set aside for 24 hours. Pack the mixture in a percolator and gradually pour the menstruum over the mixture, maintaining a layer of liquid on the top, until three-fourths of the volume are used or the exhaustion of materials is effected. Press the marc, filter the expressed liquid, and mix with the percolate. Enough menstruum is then added to make up the prescribed volume.

A good percolation depends upon thorough soaking, depth and uniformity of packing, and slow passage of the liquid.

3. Ingredients.—These require to be carefully selected. Most of them are to be powdered according to the degree of comminution as prescribed by the B.P. (see p. 53, 54). Some are to be cut small, some to be bruised, and some are used in their natural state.

LOZENGES

1. The B.P. lozenges are made like a pill-mass. Confectioners rarely use powdered gum acacia, though the B.P. directs the use of both the powder and mucilage.

OINTMENTS

2. **Ingredients.**—The essential ingredients for making lozenges are, finely powdered or icing sugar, mucilage of picked gum arabic and medicinal and flavouring agents.

3. **Operation.**—The ingredients having been thoroughly mixed and kneaded, the resulting paste is placed on a slab with adjustable edges and rolled out to the desired thickness. The lozenges are then cut out with a punch and exposed to the air for 12 or 24 hours, after which they are removed to a drying chamber.

4. **Stamping.**—While the lozenges are still soft, they are stamped with letters indicative of their composition.

5. **Packing.**—Lozenges should be kept in dry, well-fitted stoppered bottles in a dry place. Dampness makes them sticky. They are to be dispensed in wide-mouthed stoppered bottles.

OINTMENTS

1. **The preparation of Ointments** is not always easy. Special tact and care can alone turn out a good product. The following general hints are worth remembering :—

(a) If the active drug is a *solid* or a *powder*, as galls, mercuric iodide, sulphur, &c., it should be reduced to a state of fine powder before admixture with the basis ; so that the ointment may be free from grittiness.

(b) If it is a *soluble* or *deliquescent salt*, as potassium carbonate or iodide, it should be first made into a thin paste with water, before mixing with the basis.

(c) If it is a *hard extract*, a *balsam* or a *resin*, a preliminary treatment is necessary with such substances as water, oil, glycerin, or rectified spirit, as the case may be.

(d) If it is a *liquid extract*, as in the case of belladonna ointment, it must be evaporated to the required consistence.

(e) If it is an *alkaloid*, as aconitine, atropine or cocaine, it should be dissolved in oleic acid by trituration and gentle heat.

(f) If it is a *crystallized drug*, as boric acid, salicylic acid, iodoform, tannic acid, &c., it should be reduced to a fine powder, and triturated with its own weight of the basis for a while before adding the rest.

(g) If it is a *volatile substance*, such as menthol, chloral hydrate, hydrocyanic acid dilute, chloroform, it should be mixed after all the ingredients have been incorporated so as to reduce its evaporation to a minimum.

2. **Basis.**—Whatever basis is selected it should not be a chemical incompatible, nor should it in any way affect the action of the ointment. Rancid lard or ointment should never be used. If the basis becomes too soft on account of the prevailing high temperatures, as in India

PRACTICAL PHARMACY AND DISPENSING

and the Colonies, indurated lard, prepared suet, or beeswax may be added as required.

3. Incorporation of a liquid with a fatty or oily basis is best effected by slowly adding the liquid drop by drop, and keeping up a steady rotatory motion. The mortar must be warmed beforehand.

4. Spatulas.—A bone or boxwood spatula is the best for scraping, stirring or mixing ointments.

5. Two ointments, or an ointment and a liquid or oily substance, are best mixed on a porcelain slab.

6. Oleates should not be melted in a metallic cup, but in a porcelain casserole.

7. Tinctures and spirituous substances are best incorporated with the fatty medium by spreading the latter evenly on the bottom and sides of a mortar and mixing the tinctures gradually.

OINTMENTS OF SPECIAL DRUGS

1. Acid Carbohc Ointment B.P. is best prepared by using liquefied carbohc acid and a cold basis. As previously prepared part of the phenol crystallized on keeping. This is now obviated by dissolving the phenol in glycerine.

2. Chrysarobinum B.P. when dissolved by heat partly recrystallizes on cooling, as happens in the B.P. ointment. It being more soluble in castor oil than lard, a mixture of the two gives satisfactory results.

3. Glycerin can be well incorporated with extracts by first rubbing the extracts with a little hot water in a warm mortar and adding glycerin gradually.

4. Hydrargyri Perchloridum is sometimes prescribed in the shape of ointment. It must be triturated well with glycerin (2 ms. to 1 gr.) before mixing with the basis, otherwise minute particles may violently irritate the skin. When ordered with potassium iodide, both of them should be triturated first before admixture.

5. Iodine.—First triturate, then add a few drops of rectified spirit and rub with its own weight of fatty basis, and lastly mix with the remaining basis.

6. Iodoform ointment B.P. should be made by the cold process. When exposed to sunlight it changes colour from liberation of Iodine, and will then stain lint black.

7. Paraffin Ointment B.P.—Unless the melted paraffins are stirred well, the ointment is sure to be lumpy. White soft paraffin should be used for colourless ointments.

8. Resorcin readily absorbs oxygen and becomes discoloured.

9. **Thymol Crystals** are very irritating to the skin. With camphor (1 to 1), thymol forms a liquid which can be worked up into an ointment.

10. **Despatching**.—Where expense is no object, ointments should be sent out in covered pots, a piece of waxed paper intervening between the cover and the ointment. When open pots are used, tinfoil should be applied over the waxed paper.

NON-OFFICIAL OINTMENT BASES

1. **Gelatums or gelatin-pastes** were first brought to the notice of the profession by Unna. They are mixtures of gelatin, glycerin, and water in varying proportions, and are non-irritating protectives to the skin. They require to be melted before use, and are then applied with a brush. The best known of them is *gelatum Zincum* (*see Zinc*), but *Ichthyol*, *Resorcin*, and many other drugs may be usefully combined with the gelatin basis in fashionable dermatological practice.

2. **Gelanthum** is Unna's latest jelly basis. Soak *tragacanth* $2\frac{1}{2}$ drs. and gelatin 2 drs. in water 10 ozs. for 24 hours in a steam-bath, press through muslin, and add glycerin 5 drs. Heat the whole on a water-bath for 1 hour, and add water in which $\frac{1}{4}$ gr. of thymol is dissolved, to make up the product to 12 ozs. by weight.

3. **Mollins** (*see p. 72*) are prepared with superfatted soap.

PART III

ADMINISTRATION OF DRUGS

CHANNELS FOR ADMINISTRATION OF DRUGS

Having gained a sufficient knowledge of the preparation of various official and non-official drugs, the student must direct his attention to the various routes or channels through which drugs enter the circulating fluid, and exert their influence on the whole or on a particular part of the body. The activity of a drug varies greatly with the form and the mode of administration. Thus, if it is a pill, it takes a longer time to act than if it is in solution. Again, a remedy subcutaneously injected produces its effects sooner than when administered by the mouth or rectum, or used as an inunction.

The following are the various channels through which drugs enter the system.

1. **The Digestive Tract** is the most important and the ordinarily selected route.

(a) *The Mouth*.—We administer drugs by the mouth for absorption by the gastric tract. For topical action, we use gargles, collutoires, pigments, pastils, lozenges, jujubes, dentifrices, &c.

(b) *The Pharynx* is reached by pigments, pastils, collutoires, sprays, insufflations, lozenges and jujubes.

(c) *The Stomach and Intestine*.—The stomach is the chief organ of absorption, and after this the intestines. The absorption of a drug is influenced by (i) its *solubility*, and (ii) the *conditions under which it is administered*. Thus, a pill takes a longer time to absorb than a mixture. Again, salines are more rapidly absorbed than metallic salts or alkaloids. A drug acts more rapidly on an empty stomach than a full one. Mixtures, draughts, pills, powders, boluses, emulsions and confections are administered by this route.

(d) *The Rectum*.—When medication by the stomach is impossible, we take advantage of this route by means of enemas and suppositories.

2. **The Respiratory Tract** is the next most important route.

(a) *The Nose*.—What the mouth is to the stomach, the nose is to the lungs. Inhalation is carried on by the nose and mouth. Collunaria, snuffs, bougies, pigments, insufflations are used here.

(b) *The Larynx* is reached by inhalations, insufflations and pigments.

(c) *The Lungs*.—Through this channel vapours or atomised drugs rapidly enter the system. The rapidity of absorption can be gauged from the production of chloroform anæsthesia.

3. **The Skin**.—By the following methods, we can introduce medicaments into the body through the cutaneous surface :—

(a) *Enepidermic*.—In this method, drugs are simply kept in contact with the unbroken skin without friction or rubbing. Pastes, plasters, poultices, fomentations, pigments, cerates, creams, ointments, &c., are thus applied.

(b) *Epidermic or Iatroleptic*.—In this method, drugs are rubbed into the unbroken skin. As liniments, cod-liver oil inunction in scrofula.

(c) *Cataphoresis*.—By which is meant the introduction of medicines through the unbroken skin by means of an electric current. The pad of the + electrode is soaked with the medicament and placed on the part, the - electrode a short distance away. The medicament is carried by osmosis through the tissues between the poles.

(d) *Endermic*.—In this, the cuticle is first denuded to promote rapid absorption of drugs. This can be rapidly done by soaking a piece of blotting-paper or some porous tissue with strong solution of ammonia, and applying it to the skin and immediately covering it with a watch-glass or a piece of oiled silk. After a few minutes, a blister rises and the cuticle is removed, and the finely powdered drug is sprinkled over the raw surface. Morphine can be thus dusted over in ovaritis, sciatica, &c.

(e) *Inoculation*.—In this, the epidermis is punctured or scarified for introduction of medicaments; as vaccination.

4. **The Subcutaneous Tissues**.—These are reached by hypodermic or subcutaneous injection which is effected by a small syringe to which is attached a hollow needle.

5. **The Deep Tissues**.—By the same instrument we can administer drugs to deeper structures, such as the muscles and nerves. When the injection is given within the substance of a muscle, it is called *parenchymatous*. A familiar example is the intramuscular injection of corrosive sublimate in the treatment of syphilis.

6. **The Blood-vessels**.—Through these channels, blood, nutrient and saline fluids are introduced by the process of *transfusion*.

(a) *The Veins*.—The transfusion may be **immediate**, by directly introducing the flowing blood from a vein of an individual into that of a patient; and **mediate**, when warm defibrinated blood, a saline solution or milk is infused. Transfusion is very useful in post-partum hæmorrhage, collapse of cholera, syncope, &c.

(b) *The Arteries*.—Arterial transfusion is rarely resorted to, though advocated by some authorities.

7. **The Serous Cavities**.—These are only used when the local action of the drug is required.

(a) *The Pleura*.—In empyema, we can wash out the pleural cavity by antiseptic lotions.

(b) *The Peritoneum*.—An injection of saline solution or milk has

recently been advocated in severe hæmorrhage. The peritoneum may be washed out by antiseptic fluids in some varieties of peritonitis.

(c) *The Tunica Vaginalis*.—Tincture or strong solution of iodine, liquefied carbolic acid or solution of corrosive sublimate is sometimes injected to produce an adhesive inflammation in hydrocele.

8. **The Conjunctivæ and Lachrymal Ducts**.—Mydriatics, myotics, and drugs for local action in the conjunctivæ and lachrymal ducts are applied either as collyria, ointments, or powders.

9. **The Ear** is reached by injections, drops, insufflations, &c.

10. **The Bladder and Urethra** by injections and bougies.

11. **The Vagina and Uterus** by douches, injections, pigments, pessaries, medicated cottons, &c.

12. **Intra-cerebral or Subdural injections** in the treatment of tetanus, &c.

DOSAGE OR POSOLOGY

Having selected a drug and the route through which it is intended to be administered, the student must next determine its dose. The word "dose," as ordinarily understood, means the quantity of a drug which is necessary to produce a certain pharmacological action either at once or after repetitions. The study of these doses is called **posology**. By a **maximum dose** we mean the largest quantity which may be given to an adult without producing evil effects, and by a **minimum dose** the lowest quantity which is necessary to obtain a physiological action. The B.P. doses represent only average ordinary doses for an adult. The student must steadily bear in mind that the action of a drug varies with different doses. Thus, antimonium tart. is a diaphoretic in $\frac{1}{2}$ to $\frac{1}{3}$ gr. and an emetic in 1 to 2 grs.; zinci sulphas is a tonic in 1 to 3 grs. and an emetic in 10 to 30 grs.; ipecacuanha radix is an expectorant in $\frac{1}{4}$ to 2 grs. and an emetic in 15 to 30 grs. Though the B.P. posology is meant as a general guide, yet the practitioner can reduce the minimum and exceed the maximum limits of the pharmacopœial doses. For instance, the B.P. dose of Tr. aconite for repeated administration is 2 to 5 ms., we often give it in drop doses. Again, we daily exceed the official maximum doses of quinine salts, potassium iodide, bismuth salts, male fern, opium, &c.

In determining doses, the following circumstances should be taken into consideration:—

1. **Age**.—The dosage varies considerably with the age. By **adult dose** we mean the dose for a person between 20 and 60 years of age. Children should get a fractional part of the adult dose. A practical method of calculating the children's doses under 12 years, is given by Young. *The rule is to divide the age in years by the age in years plus 12; the resulting quotient is the proper fraction of an adult dose.* Thus:—

For a child of 1 year, the dose will be $\frac{1}{1+12} = \frac{1}{13}$ of an adult dose.

„	4 years	„	$\frac{4}{4+12} = \frac{1}{4}$	„
„	8 years	„	$\frac{8}{8+12} = \frac{2}{5}$	„

From 12 to 16 years $\frac{1}{2}$ to $\frac{3}{4}$, and from 17 to 20 $\frac{3}{4}$ to 1, are the proportions. Over 60 years, the dosage should again be diminished slightly. For hypodermic medication, the dose is one-half of what is given by the mouth, and for rectal medication, it is the normal dose plus one-fourth, except in the case of strychnine, which should be exhibited in smaller quantities than when given by the mouth (*see* Nux Vomica).

2. **Sex.**—Women, as a rule being more delicate than men, cannot bear full adult doses. The menstrual period should also be taken into consideration. For instance quinine, if given during the period, may cause alarming hæmorrhage.

3. **Size and Body Weight.**—The quantity which is required to produce a certain physiological effect in a strong, healthy, and stout person of more than average size and weight, is certainly not necessary to produce the same action on a thin and weak individual.

4. **Temperament** has some influence on doses. A person with a sanguine or nervous temperament requires smaller doses than one with a lymphatic one.

5. **Idiosyncrasy.**—Individual susceptibility to the action of a particular drug or drugs has long been recognised. We often come across patients who cannot take a grain of potassium iodide without coryza, though ordinarily many can take it in 5 gr. doses without inconvenience. Quinine sulphate does not agree with many. Others again are readily salivated by quite small doses of mercury.

6. **Toleration and Habit.**—Certain drugs, for some reason or other which we cannot explain, fail to produce the same effects with the same dose, when continued for a lengthened period. This is what specially happens with opium. Its dose must be increased after a while, in order to get the full or the original effects of the drug. This gradual loss of activity is due to **toleration by custom**. Sometimes the person taking it becomes so addicted to its use that he actually craves for and indulges in it, to the detriment of his health. This craving for a particular drug is called a **habit**. Like opium-habit, persons may contract alcohol-habit and cocaine-habit. Tolerance is also established in the case of arsenic, as the arsenic-eaters of Styria. Zinc sulphate acts as an emetic in 20 grs., but patients can tolerate the same or even more if the dose is slowly increased, as in some nervous diseases.

7. **Rate of Absorption and Excretion.**—The quicker the absorption, or the slower the excretion, the greater is the effect produced by a drug. Thus morphine subcutaneously injected, requires a smaller dose to produce a definite action, within a definite period, than what is necessary if administered by the mouth or rectum (*see* Action of Curare).

8. **Mental Condition.**—A morbid inclination of the mind towards the action of a particular drug increases the action of the same. Thus, if

a patient can be convinced that he will sleep by a certain draught a small dose of a hypnotic may induce sleep.

9. **Fasting.**—A drug acts more powerfully on an empty stomach than on a full one. Thus the same quantity of alcohol which would intoxicate a person if taken on an empty stomach, can be ingested with impunity if taken during or after meals.

10. **Race.**—Europeans who are accustomed to the use of allopathic drugs require larger doses than Indian villagers, who have never used them in their lives. For example, an Indian villager getting an attack of intermittent fever can be cured by 10 to 15 grs. of quinine sulphate, while the same fever in a European would require at least four times the quantity.

11. **Disease.**—Many diseases considerably modify the dosage of medicines. Thus, opium is borne in surprisingly large doses in biliary and renal colic, and in severe inflammation of the peritoneum and intestine. Large doses of mercury are tolerated in syphilis, but in Bright's disease both opium and mercury are ill-borne.

12. **Climate.**—It is a well-known fact that alcohol can be consumed in larger quantities in cold countries than in hot climates.

13. **Season.**—Certain remedies no doubt affect the constitution more powerfully at certain seasons of the year than at others. Thus, iodide of potassium acts more readily during the rainy months than in the summer.

14. **Hours of the Day.**—Vital force is lowest at the early hours of the morning. Consequently, in debilitating diseases, stimulants are more necessary at this time than later on in the day.

15. **Time of Administration.**—It is useless to administer even a very large dose of chloral hydrate when the person is in active labour, it should be given at bedtime. Cod-liver oil should always be given after food; given at any other times it may derange digestion. Iron and arsenic, too, should always be given on a full stomach.

16. **Preparations of a Drug.**—Alkaloids, glucosides, neutral principles, extracts, &c., are all prescribed in smaller doses than the crude drugs from which they are prepared. Thus, for 5 grs. of quinine sulphate, we should have to prescribe about 200 grs. of cinchona bark, had we no such preparation as quinine.

17. **Accumulation.**—Ordinarily a drug after introduction into the body is either slowly or rapidly excreted. But if we continue to administer it very frequently for a sufficient length of time, i.e. so quickly that it cannot be fully eliminated, a time may come when it will accumulate to such an extent as to produce suddenly toxic symptoms. This is called the *cumulative action* of a drug. It may be caused by the following circumstances :—

(a) *Rapid absorption and slow elimination of a drug.*—This occurs in the case of lead and mercury, both of which are eliminated slowly and with difficulty by the kidneys.

(b) *Sudden arrest of the excretion of a drug.*—Digitalis and strychnine are cited as examples of this class. During a course of digitalis treatment, if no precaution is taken, symptoms of poisoning may suddenly develop, without any increase of the dose. These toxic symptoms are

said to be due to the powerful contraction of the renal vessels, which suddenly retards the elimination of the drug.

(c) *Sudden solution and absorption of a sparingly soluble drug owing to some changes in the contents of the intestine* (Hale White).

GROUPING OF DOSES

The following grouping of doses will be a useful adjunct to the study of posology :—

	<i>Group</i>	<i>Doses</i>
Acids , inorganic diluted, all (except hydrobrom. 15 to 60 ms.)		5 to 20 ms.
„ vegetable crystallized (except tannic 2 to 5 grs.)		5 to 15 or 20 grs.
Aqueæ , all (except laurocerasi $\frac{1}{2}$ to 2 drs.)		1 to 2 ozs.
Confections , all		60 to 120 grs.
Decoctions , all		$\frac{1}{2}$ to 2 ozs.
Effervescent powders , all		60 to 120 grs.
Extracts , alcoholic, non-poisonous		2 to 8 grs.
„ „ poisonous		$\frac{1}{4}$ to 1 gr.
„ aqueous (except aloes barb. 1 to 4 grs., krameria 5 to 15 grs. and opi $\frac{1}{4}$ to 1 gr.)		2 to 8 grs.
Infusions , all (except digitalis 2 to 4 drs.)		$\frac{1}{2}$ to 1 or 2 ozs.
Liquors , containing arsenic and strychnine		2 to 8 ms.
„ containing morphine salts		10 to 60 ms.
„ vegetable concentrated (except sarsa co. 2 to 8 drs.)		$\frac{1}{2}$ to 1 dr.
„ containing iron		5 to 15 ms.
Mixtures , all		$\frac{1}{2}$ to 1 or 2 ozs.
Oils , Volatile, all (except copaibæ, cubebæ 5 to 20 ms.; santali 5 to 30 ms.; terebinth 2 to 10 ms. or 3 to 4 drs.)		$\frac{1}{2}$ to 3 ms.
Pills , all (except ferri 5 to 15 grs.; phosphori 1 to 2 grs.; plumbi c. opio 2 to 4 grs.; saponis co. 2 to 4 grs.)		4 to 8 grs.
Spirits , simple, all (except æther. 20 to 40 or 60 to 90 ms.; juniper 20 to 60 ms.)		5 to 20 ms.
Spirits , compound, all (except armoraciæ 1 to 2 drs.)		20 to 40 ms. or 60 to 90 ms.
Succi , all (except belladonnæ 5 to 15 ms. and hyoscyam. $\frac{1}{2}$ to 1 dr.)		1 to 2 drs.
Syrups , all (except cascar. arom., chloral, codeinæ, rhei, sennæ $\frac{1}{2}$ to 2 drs.)		$\frac{1}{2}$ to 1 dr.
Tinctures , all (except Tr. iodi 2 to 5 ms.)		30 to 60 ms. or 5 to 15 ms.

INCOMPATIBILITY AND ANTAGONISM

A prescription should not contain any ingredients which can counteract one another either physically, chemically or physiologically, when mixed together. If they do so, they are known as **Incompatibles**. Incompatibility, therefore, may be of the following kinds :—

I. Physical.—This is also known as *pharmaceutical*, and occurs when the ingredients are not soluble in water, so as to produce a clear solution. As oils, insoluble powders, some spirits, resinous tinctures, some extracts, &c., when ordered in a mixture.

II. Chemical.—Such drugs should not be prescribed as would chemically react on one another, unless such a reaction is desired. Chemical incompatibility can be classified under two heads:—

A. Homogeneous.—In this *no visible change of form*, such as the liberation of a gas or formation of a precipitate occurs, though colour may be changed. Thus, acids and bases are chemically and physiologically incompatible with each other; *e.g.* lactic acid with lime water, diluted hydrochloric acid with aromatic spirit of ammonia. Again, if the resulting salt is soluble and poisonous, the chemical neutralization cannot resist the toxic action, as hydrocyanic acid and alkalis, for KCN is as poisonous as HCN, although the alkaline carbonates are not incompatible with HCN.

B. Heterogeneous.—In this there is *a visible change of form*, *i.e.*, the production of a gas or a precipitate. CO_2 is the chief gas liberated in such a decomposition, sometimes H_2S . The precipitates or the insoluble compounds form the largest chemical incompatibilities. This class can again be subdivided into:—

1. *Intentional.*—Seidlitz powder, black wash, yellow wash, sodii citro-tart. efferv., all effervescing mixtures, &c., are examples of this variety. Vegetable astringents with chalybeates, and lead salts with solutions of opium also come under this category.

2. *Avoidable.*—This form of chemical incompatibility is very difficult to master. A complete knowledge of chemistry and solubility of drugs can alone help the student out of this difficulty. The following rule would greatly minimise his errors:—“*A drug should never be ordered in combination with any of its tests or antidotes.*” Thus, carbonates should not be given with free acids (except HCN and H_2S); acid salts, basic salts, double citrates, *e.g.* scale preparations of iron, halogens with solution of ammonia, &c.

Alkaloidal salts should not be prescribed with alkaline carbonates or hydroxides, *e.g.* liqr. strychnine with spt. ammon. aromat. or morphine acetate with sodium or potassium bicarbonates, &c. Pot. iodide and tannic acid also throw down alkaloidal precipitates, especially if the solution is concentrated (*see* p. 84). Many fatal accidents have taken place from swallowing the last dose of a mixture containing a poisonous alkaloidal precipitate. Although, to some extent, the alkaloidal incompatibility can be avoided by the addition of HCl and alcohol, yet it is a safer plan to follow the practical rule of Dr. W. G. Smith:—“*All poisonous alkaloids should as far as possible be prescribed in simple solution, and not in too concentrated a state.*” *

* This portion is copied from Dr. Smith's article in the *Practitioner* Oct., Nov., and Dec. 1899.

Sometimes explosive combinations result from inattention to grave incompatibility (*see below*).

III. Physiological.—When the pharmacological action of a drug is antagonised by that of another, both drugs are *physiological incompatibles* or *antagonists*. It is presumed that this antagonism takes place either in the blood or in the tissues. We do not know any drug which can fully and completely counteract the action of another on all points, though instances are common where *partial antagonism* takes place. Thus, opium contracts the pupils and depresses the respiratory centre, belladonna dilates the pupils and stimulates the respiratory centre (*see Opium and Belladonna*); hence both of them are partially physiological incompatibles to each other. Digitalis counteracts the action of aconitine on the heart; and strychnine and brucine that of physostigmine, bromides and chloral hydrate on the cord. The depressant action of aconitine on the heart is also neutralized by the stimulant action of atropine, daturine and hyoscyamine on the same organ. Pilocarpine increases, while atropine decreases, both salivation and perspiration.

EXPLOSIVE COMBINATIONS

Certain drugs, such as chlorates, bichromates, iodates, nitrates, picrates, permanganates, oxide of silver, &c., are **rich in oxygen** or part with it very easily: while others, such as sulphur, sulphides, iodine, reduced iron, hypophosphites, organic powders, charcoal, camphor, iodide of iron, ammonia salts, essential oils, &c., are **easily oxidizable**. An admixture between any two of these classes is sure to result in an explosive combination. The following are a few typical examples:—

1. A few tablets of potassium chlorate kept in a pocket with a box of safety matches cause explosion.
2. Potassium chlorate with tannic acid, catechu, morphine hydrochloride, or gallic acid mixed as a dry powder has been known to explode.
3. A mixture of Tr. Ferri Perchlorid., glycerin, and potassium chlorate explodes when warm.
4. Calcium hypophosphite alone, when triturated hard; sometimes causes explosion. Never heat it with glycerin.
5. Potassium permanganate should not be made into a pill with vegetable extracts or combined with glycerin (*see p. 90*).
6. Oil of turpentine and sulphuric acid, and amber oil and nitric acid are sure to explode violently.
7. Oxide or nitrate of silver with creosote forms a compound which may take fire if it becomes warm.
8. Chromic acid with glycerin, ether, strong alcohol, or organic substances cause an explosive combination.
9. Chloral hydrate and spt. ammon. aromat. in a mixture liberate so much chloroform as to explode.

10. Bismuth subnitrate and sodium bicarbonate given in a mixture, liberate CO_2 to cause an explosion (*see* p. 81).

11. Tr. iodine and solution of ammonia should not be prescribed together as iodide of nitrogen is formed, which causes explosion (*see* p. 82).

12. Erythrol tetranitrate is very sensitive to percussion. A young chemist lost his life from explosion due to the rubbing of the tetranitrate with milk-sugar in a mortar.

13. Nitric acid should not be mixed with glycerin.

14. Chloride of lime triturated with sulphur causes explosion.

POISONOUS COMBINATIONS

1. Potassium chlorate and potassium iodide in solution do not react in ordinary temperatures but in the body produce a poisonous product, probably iodate of potassium.

2. Potassium chlorate given with Syr. Ferri Iodide liberates free iodine in the stomach and causes severe gastric irritation.

3. Hydrocyanic acid dilute with metallic hydrates, carbonates, subnitrates, or subchlorides forms cyanides of metals which are more poisonous than the acid.

COMBINATION OF DRUGS

One or two words with reference to the combinations of drugs will be of use to a prescriber, whose first aim ought to be to present his patient with an effective and rational prescription free from incompatibles. An admixture of 12 or 15 ill-understood and ill-chosen drugs, in the hope that either one or other of them may hit the right nail on the head, can no longer be tolerated in these days of rational therapeutics. The student is therefore strongly advised never to prescribe unless he is quite sure of the pharmacology of the drugs he is using. Simplicity in combination should be the rule, but it does not follow that one drug only at a time is to be given in distilled water. An effective combination of judiciously selected medicines is of the utmost value in the treatment of diseases. The following are the advantages claimed, therefore, for a good combination:—

1. *The efficacy of a drug can be greatly increased by combining it with different preparations of the same.* Thus, if we desire to obtain the full effects of cinchona, we can get them best by combining its extract, tincture, and infusion in one prescription. So also the full effects of calumba by prescribing tincture and infusion at the same time.

2. *By a combination of various drugs, whose actions bear resemblance with one another, we can augment or intensify certain properties of a drug.* Thus, a mixture of salts of potassium, sodium, and lithium will produce more diuresis, or increase the alkalinity of urine more rapidly than when given separately. If we desire to increase the astringent

action of kino, we should combine it with catechu, krameria and logwood.

3. *By a careful admixture of corrigens, we can correct unpleasant and undesirable properties of a drug.* Thus, ginger is added to Pulv. Rhei Co., Pulv. Jalap. Co., and Pulv. Scammonii Co., to remove the griping properties of the potent drugs. Hyoscyamus and belladonna correct the griping caused by colocynth. Hydrobromic acid lessens the cinchonism of quinine, and sal volatile the iodism of iodides. Arsenic prevents a bromide rash, and atropine the unpleasant symptoms caused by the injection of morphine.

4. *By a combination of two or more drugs individually producing entirely different physiological effects, we can sometimes increase the potency of a remedy in a particular direction.* Thus, by combining mercury and iodide of potassium with digitalis and squill, we can increase the diuretic properties of the latter drugs. The action of magnesium sulphate is enhanced by the admixture of iron and sulphuric acid. Iron and digitalis in combination are more powerful cardiac tonics than when they are given uncombined.

5. *By regulating the doses of various medicines of a particular class, though differing in their modes of action, a better and more valuable remedy can be obtained.* Thus, by prescribing potassium bromide and morphine in combination, we can induce sleep more effectually than if they are given separately. A good and effectual purgative is obtained by mixing jalap with cream of tartar, as Pulv. Jalap. Co.

6. *By mixing such drugs as chemically decompose each other, we at times get better results from the resulting products.* Thus, by giving potassium or sodium carbonate with citric acid, we derive the benefit of carbonic acid gas and potassium or sodium citrate. When mercuric chloride and potassium iodide are combined in a mixture, iodide of mercury is formed, which is much stronger and more efficacious than the salt prepared by an elaborate process.

7. *By a combination of such substances as would assist the solubility or absorption of a drug, a more effective remedy can be obtained.* Thus, salicylic acid is almost insoluble in water, but it is rendered entirely soluble by the addition of borax, alkaline carbonates, hydroxides, &c. (see Acidum Salicylicum). The absorption by the skin of the alkaloids of belladonna is greatly facilitated if belladonna is combined with fat, glycerin, oil or chloroform. Oleic acid is combined with alkaloidal salts in ointments, because it is a solvent for the same.

8. *For preservation of certain substances, a combination becomes necessary.* Thus, alcohol is added to succi and liquid extracts and glycerin to animal ferments with a view to their preservation.

9. *A combination becomes essential when we want to divide a potent drug.* Thus, to divide strychnine (see p. 77), arsenic or atropine, we mix them with sugar of milk or any other inert powder.

ART OF PRESCRIBING

WEIGHTS AND MEASURES IN A PRESCRIPTION

The weights and measures of capacity and length used in a prescription are those of the Imperial system (*see* p. 13), though the scruple and the drachm are still permitted to exist under protest. Besides, certain signs indicating weights and measures of capacity are also common, which have not been officially recognised. They are :—

- G. = Granum, 1 grain = $\frac{1}{480}$ of a Troy ounce or $\frac{1}{177}$ of an Avoirdupois ounce.
 ℞ = Scrupulum, 1 scruple = 20 grains.
 ℥ = Drachma, 1 drachm = 3 scruples or 60 grains; or $\frac{1}{8}$ of a fluid ounce, or 60 minims.
 ℥ = Uncia, 1 ounce = 1 Troy ounce (480 grs.) or 1 fl. oz. (480 minims) or 437.5 grains of water.
 M. = Minimum, 1 minim = $\frac{1}{60}$ part of a drachm or the volume of .91145 grains of water.
 Gtt. = Gutta, 1 drop, supposed erroneously to represent 1 minim. (It varies so much in size that it should neither be used in dispensing nor as a measure for powerful drugs (*see* p. 77).
 O. = Octarius, 1 pint = 20 fluid ounces, or $1\frac{1}{2}$ lbs. of water.
 C. = Congius, 1 gallon = 8 pints or 10 lbs. of water.

ENGLISH DOMESTIC MEASURES

- A tea-spoonful = 1 fluid drachm, ℥i or a little more.
 A dessert-spoonful = 2 fluid drachms, ℥ii (about).
 A table-spoonful = 4 fluid drms. or $\frac{1}{2}$ ounce, ℥iv or ℥ss. (about).
 A wine-glassful = 2 fluid ounces, ℥ii or more.
 A gill = 4 fluid ounces, ℥iv or more.
 A tea-cupful = 7 fluid ounces or more.
 A breakfast-cupful = 8 fluid ounces or more.
 A glassful = 12 fluid ounces or more.
 A tumblerful = 15 to 20 fluid ounces.

These are only average measurements, for no cups or spoons are of the same size.

INDIAN DOMESTIC MEASURES

MEASURES OF CAPACITY CURRENT IN THE BENGAL PRESIDENCY

- A Half-kancha = $\frac{1}{2}$ chattaek or $\frac{1}{16}$ seer = 2 fl. drachms (about).
 A Kancha = $\frac{1}{4}$ ch. or $\frac{1}{8}$ seer = 4 fl. drms. or 218.75 grs. of dist. water.
 A Half-chattaek = $\frac{1}{2}$ poa or $\frac{1}{32}$ seer = 1 fl. ounce (about).
 A Chattaek = $\frac{1}{4}$ poa or $\frac{1}{16}$ seer = 2 fl. ounces (about).
 A Poa = $\frac{1}{2}$ seer = 8 fl. ounces (about).
 A Half-seer = $\frac{1}{2}$ seer = 16 fl. ounces (about).
 A Seer or 64 kancha or 16 chattaeks = 32 fl. ounces (about).

MEASURES OF CAPACITY CURRENT IN THE BOMBAY PRESIDENCY

A Sundia-palliful	=	1 drm.
A Card-palliful	=	5 tollas or 2 ounces.
A Swayapak-palliful	=	10 tollas or 4 ounces.
A Panchpatriful	=	8 or 12 ounces.
A lota or tambiaful	=	3 or 4 lbs.

ABBREVIATIONS OR CONTRACTIONS IN PRESCRIPTIONS

Ambiguous nomenclature is a source of confusion and error, and must therefore be avoided in prescriptions. The following are a few examples of ambiguous nomenclature :—

Mag. Calo.	may mean either	Mag. Ponderosa* or Mag. Levis.
„ Carb.	„ „	Mag. Carb. Ponderosa or Mag. Carb. Levis.
Bismuth	„ „	Bismuth Carb., Bismuth Oxide, Bismuth Subnitras* or Bismuth Salicylas.
Aloes	„ „	Aloes Soc.* or Aloes Barb.
Æther Chloric	„ „	Æther Chloric (Duncan's) or Spt. Chloroformi B.P.*
Ferri Cit.	„ „	Ferri et Ammon. Citras,* or Ferri et Quininas Citras.
Liq. Morph.	„ „	Liq. Morphin. Hydrochlorid., Liq. Morph. Acetat. or Liq. Morph. Tartrat.
Ext. Belladon.	„ „	Ext. Bellad. Alcohol., Ext. Bellad. Liq., or Ext. Bellad. Viride.*
Acid. Hydroc.	„ „	Acid. Hydrocyanicum or Acid. Hydrochloricum.
Ext. Col.	„ „	Ext. Colchici or Ext. Colocynth.
Hyd. Chlor.	„ „	Hydrate Chloral, Hydrarg. Chloridum (calomel) or Hydrarg. Perchlorid. (corrosive sublimate).
Aqua Menth.	„ „	Aqua Menth. Pip.* or Aqua Menth. Virid.
Liq. Plumbi †	„ „	Liq. Plumb. Subacetat. Fort. or Liqr. Plumb. Subacetat. dil.*

The following contractions of words are ordinarily seen in prescriptions :—

Contr.	Name	Meaning	Contr.	Name	Meaning
aa.	Ana	Of each.	Olo	..	To strain.
Ad.	Adde	Add.	Co. or Comp.	Compositus	Compound.
Aq.	Aqua	Water.	Cras	..	To-morrow.
Aut	..	Or.	Div.	Divide	Divide.
C.	Cum	With.	Et	..	And.
Cap., Opt.	Capiat	Let the patient take.	F.	Fao	Make.

* In practice, preparations with * are dispensed when no reference can be made to the prescriber.

† This was the subject of a question in practical dispensing. It was intended for Goulard's lotion.

<i>Contr.</i>	<i>Name</i>	<i>Meaning</i>	<i>Contr.</i>	<i>Name</i>	<i>Meaning</i>
Ft.	Fiat	Let it be made.	Om.	Omnis	All, every.
Gr.	Granum	A grain.	R.	Recipe	Take.
Gtt.	Gutta	A drop.	Rept.	Repetatur	Let it be repeated.
Hauft.	Hauftus	A draught.	Sine	..	Without
H.	Hora	An hour	Sig.	Signa	Mark.
In.	..	In or into.	Ss.	Semmis	Half.
Ind.	Indie	Daily.	Stat.	Statim	Immediately
Levis	..	Light.	Talis	..	Such.
M.	Massa	A mass.	Vel	..	Or.
M.	Misce	Mix.	Ver.	Verus	Genuine.
M. or Min.	Minimum	A Minim.	Vesp.	Vesper	The evening.
Mist.	Mistura	A Mixture	Vetus	..	Old.
Mitte	..	Send.	Vitellus	..	The yolk of an egg.
Nox	..	Noight.			

The following contractions of phrases are often used in prescriptions :—

<i>Contraction</i>	<i>Phrase</i>	<i>Meaning</i>
Ad lib.	Ad libitum	At pleasure.
A. H.	Alternis Horis	Every other hour.
Aq. Bull.	Aqua Bulliens	Boiling water.
„ Dest.	„ Destillata	Distilled water.
„ Ferv.	„ Fervens.	Hot water.
„ Font.	„ Fontalis.	Spring water.
„ Pluv.	„ Pluvialis	Rain water.
Bis ind.	Bis indies	Twice daily.
B.P. or Ph.B.	Pharmacopœia Britannica	British Pharmacopœia.
C.M.	Cras mane	To-morrow morning.
C.N.	Cras nocte	To-morrow night.
Coch. amp.	Cochleare amplum	A table-spoonful.
„ mag.	„ magnum	Do.
„ med.	„ medium	A dessert-spoonful
„ min.	„ minimum	A small spoonful or a tea-spoonful.
„ parv.	„ parvum	A tea-spoonful.
C. Vinar.	Cyathus Vinarius	A wine-glass.
Dieb. alt.	Diebus alternis	On alternate days.
D. in p. æ or	Dividatur in partes æquales	Let it be divided into equal parts.
Div. in p. seq.		
F. A. O.	Folio Argenti Obruantur.	Let it be rolled in silver leaf.
Ft. Haust.	Fiat Haustus	Let a draught be made.
F. M. or Ft. Mist.	Fiat Mistura	Let a mixture be made.
Ft. Mas. in	Fiat Mass in pilulæ	Let a pill mass be made and divide into 12 pills.
pil. xii div.	xii divide	
H. D.	Hora decubitus.	At bedtime.
H. S. or H. S. S.	Hora Somni Sumendum	To be taken at bedtime.
M. B.	Misce Bene	Mix well.
M. D. U.	More dicto utendum.	To be used as directed.
M. P.	Massa Pilularis	A pill mass.
Mic. pan.	Mica panis	Crumb of bread.
Ne tr. s. num.	Ne tradas sine nummo	Do not deliver unless paid.

<i>Contraction</i>	<i>Phrase</i>	<i>Meaning</i>
O. M.	Omni mane . . .	Every morning.
Omn. bih.	Omni bihoria . . .	Every two hours.
O.N.	Omni nocte . . .	Every night.
P. R. N.	Pro re nata . . .	When required, occasionally.
Q.s.	Quantum sufficit . . .	Sufficient quantity.
Q.h., O.h.	Quaque hora or Omni hora	Each or every hour.
S.S.	Statim sumendum. . .	Immediately to be taken.
T.d.	Ter in die . . .	Thrice daily.

PREScription WRITING

A prescription is **simple**, when it contains a basis and a vehicle or excipient with or without a corrective; and **complex**, when it contains several adjuvants and corrigents besides the basis. The construction of a model prescription must be in the following order:—

1. The **Superscription**, which consists of the symbol *Re*, which originally symbolized the planet Jupiter, but is now an abbreviation of *recipe* = "Take Thou."
2. The **Inscription** or the body of a prescription, containing the *basis*, the *adjuvant*, the *corrigent*, and the *vehicle* or *excipient*.
3. The **Subscription** or the directions to the dispenser, such as *misce*, *fat*, *mist*, *pilula*, &c.
4. The **Signature** (from *L. Signetur*—let it be labelled) or the directions to the patient. This is written either in English or in vernacular.
5. The **Prescriber's name or initial** and the **date**. These we put at the bottom. The patient's name should invariably be written at the top of the *recipe*.

The following is an example of a model prescription:—

Patient's name. W. Thomas, Esqr.

Superscription.—*R*

Inscription. { Liqr. Ammon. Acetat. . . *℥ii (Basis)*
 Pot. Acetas . . . *gr. x (Adjuvant)*
 Spt. Æther. Nit. . . *m. xx (Adjuvant)*
 Syr. Aromat. . . *℥i (Corrigent)*
 Aq. Destill. . . *ad. ℥i (Vehicle)*

Subscription. { M., ft. mist., Mitto talis vi.
 div. in p.

Signature.—*Sig.* $\frac{1}{4}$ th part every 3 hours during fever.

Date, 20.1.01.

Prescriber's name, R. Ghosh.

It is customary to write prescriptions in Latin. But directions should, as a rule, be given in the language of the country. They should be legibly written and ambiguous nomenclature avoided. In case the B.P. limits of

* In India, paper or bottle graduation is generally used to mark the doses of a mixture (*sec p. 76*).

doses are exceeded, the doses should be initialed. They must be revised and, if possible, copies kept before they are handed over.

ELEGANT PRESCRIPTIONS

Elegance in a prescription should always be aimed at, but it does not follow that the student should prescribe only fancy pills, capsules, tablets and cachets. These are good and useful, but they cannot supply the place of a mixture. The importance of giving a mixture in an inviting and palatable form cannot be over-estimated. We have various flavouring agents. Aromatic syrup, syrups of orange, orange-flower, glucose, hemidesmus, lemon, Virginian prune, tolu and ginger are the popular ones. During the hot months, mixtures containing syrups soon decompose, but glycerin and flavouring waters may be substituted for them. Spirit of chloroform, chloroform water and liquid extract of liquorice cover the taste of many bitter and saline mixtures. Syrup of yerba santa disguises fairly well the taste of quinine salts. Rose water, orange-flower water, cinnamon water and anise water are good flavouring vehicles either for mixtures or for lotions. Cinnamon water disguises the odour of castor oil. Syrup of roses and red poppy are only used as colouring agents. Compound tinctures of lavender and cardamoms are used both for flavouring and for colouring purposes. Liniments or ointments can be perfumed by otto of roses, oil of neroli and lavender. Nauseous and bitter powders can be given in cachets, or pills which can be coated or gilded (*see* pages 90-2).

DIRECTIONS TO THE PATIENT

Make it a point to give directions in a definite manner. They should be short, simple and to the point. It is very important to mention the hour of the day when medicines are to be administered. To the student this may appear confusing in the beginning, but the following hints will aid him in this direction :—

1. Mineral acids, as a rule, are given after meals, except in cases where we want to check the excessively acid secretion—gastric juice.

2. When we want to neutralize the acid secretion, we give alkalis, such as sodium bicarbonate, &c., after food ; but before food when the gastric secretion requires stimulation.

3. Gastric sedatives, such as acid, hydrocyanic, dilute, bismuth salts, are best given on empty stomach, as we want their local action.

4. Pepsin, papain, taka-diastase, extract of malt, should be given immediately after or along with the meals.

5. Pancreatin or other pancreatic ferments should be given two hours after food, along with sodium bicarbonate, as they aid duodenal digestion.

6. Cod liver oil and its preparations should be administered after, and not before food. If given before they spoil appetite.

7. All preparations of iron, specially the astringent varieties, are to be administered after meals.

8. All stomachics and bitter tonics, such as calumba, chiretta, quassia, are given $\frac{1}{4}$ to $\frac{1}{2}$ hour before food.

9. Arsenic is always given after meals, except in few rare cases, where its local action on the stomach is desired.

10. Potassium permanganate is always given after food.

11. Castor oil should be given on an empty stomach in the early morning.

12. Cathartic pills containing aloes should be given after dinner, as they take about 12 hours to act.

13. Emmenagogues should be taken at least one week before menstruation.

14. All diaphoretics act well when the patient is kept warm, and diuretics when cool.

15. Hypnotics, as a rule, should be taken at least half an hour before going to bed; but sulphonal two or three hours before, as it dissolves slowly.

16. Morphine should be administered subcutaneously when the patient is in bed.

17. Bromides, when given as a sedative, are to be administered after meals or at bedtime.

PREScriptions FOR CHILDREN

Great tact and caution are required in prescribing for children. The hints given below will greatly help the student in this direction:—

1. The dosage must be in proportion to the age (*see* p. 104).

2. The bulk of a mixture must be small, not exceed one or at the most two tea-spoonfuls.

3. Medicines must be made as palatable as possible. Children like either sweet or tasteless medicines. They refuse bitters. Equisine may be used as a tasteless substitute for quinine salts. Quinine should not be dissolved in mineral acids, as its bitterness is intensified.

4. Infants do not refuse either castor oil or cod liver oil, but older children often reject the former. Cod liver oil with extract of malt is never refused.

5. Never order pills for children, give dry drugs in the form of powders mixed with honey, syrup, milk, sweetened water, malt extract, or jam.

6. Suckling babes are best treated by giving medicaments to their mothers; but some medicines, such as copaiba, oil of turpentine, asafetida, make the milk so nasty that they refuse to draw it. By giving mercury and potassium iodide to mothers infantile syphilis can be cured.

7. They can bear belladonna and hyoscyamus in fairly large doses.

8. Arsonic, too, is well borne, some choreic children can take very large doses without harm (*see* Arsenic).

9. A tea-spoonful of castor oil to a newly-born babe is not a big dose.

10. Goodeve's Red Mixture is a very useful carminative aperient (*see* Rhubarb).

11. Children are **very susceptible to opium**.^{*} Opium and its preparations should therefore be avoided in children's practice. If administered at all, they must be given in very minute doses and the effects watched. Even liniments and fomentations containing opium should be used with caution.

12. Plain dill or anise waters make good all-round general vehicles for children's mixtures.

13. For round worm, santonin must be given on an empty stomach either suspended in castor oil or mixed with sugar at night, and then followed by a dose of castor oil next morning. The writer gives it with calomel and sugar followed by oil.

14. Children tolerate calomel better than adults and are rarely salivated.

15. Expectorants are best given in the form of syrups or mixed with a syrup.

16. To induce vomiting ipecacuanha powder gr. v. or even gr. x. should be given, or better tickle the pharynx with the finger or a feather.

^{*} In some parts of India infants are habituated to the use of opium. It is given with a view to keep them quiet while their mothers are at work. Many native wet-nurses secretly administer this drug to their wards. The writer has seen an infant only 14 months old taking daily one grain of opium without any other evil effects than constipation.

PART IV

PHARMACOLOGY

GENERAL PHARMACOLOGY OF DRUGS

By the action of a drug on the human organism, we mean an interaction between a drug and the blood and the tissues, whereby on the one hand, either the composition of the blood is modified, and the anatomical state and physiological activity of the various tissues is altered; or on the other hand, the composition of the drug itself is affected. Thus, potassium chlorate, amyl nitrite, phenazone, pyrogallie acid destroy red blood corpuscles. Pilocarpine increases the secretion of saliva, atropine checks it; sodium and potassium citrates are decomposed into carbonates in the blood.

Unfortunately, there is no law to guide the student in the determination of the pharmacology of a drug, but the following will to some extent aid him in its study:—

1. An intimate relation exists between the chemical composition and constitution, and the physiological action of a drug, as will be evident from the following:—

(a) *The intensity of action of a drug increases in proportion to its atomic weight, but this is only possible in those compounds which are isomorphous, i.e. which crystallize in the same form.* Thus, magnesia, ferrous salts, manganous salts, nickel, cobalt, copper, zinc and cadmium agree in action, but differ in degree. The toxicity of cadmium is the greatest and that of magnesia the least.

(b) *The molecular arrangement in a compound sometimes determines the action of a drug, without reference to its molecular weight.* Thus isomerides have the same chemical composition and the same percentage of weight, but differ in properties, on account of their different molecular arrangements. Resorein and pyrocatechin are isomers $C_6H_4(OH)_2$. The former is sweet, the latter is bitter.

(c) *It is possible to modify the physiological action of a drug by artificially modifying its chemical constitution.* Drs. Fraser, Crum Brown and others have shown that by introducing a methyl radical into the molecules of strychnine, brucine and thebaine, new compounds are formed, which instead of acting as convulsants, are paralyzers of the peripheral terminations of the motor nerves.

(d) *The action of a drug is sometimes determined either by the base, the acid, or the salt; the action of acid and base being lost by union.* Thus, caustic soda and hydrochloric acid are powerfully caustic, but this property is lost when they unite to form two such inert substances as sodium chloride and water.

The following table taken from Brunton will illustrate how bases and acids influence the action of medicines.

DIFFERENT ACIDS			DIFFERENT BASES		
Sodium Hydrate		<i>caustic.</i>	Sodium Chloride		<i>neutral in action.</i>
„ Bicarbonate		<i>antacid.</i>	Potassium „		<i>muscular poison.</i>
„ Sulphate		<i>purgative.</i>	Zinc „		<i>caustic.</i>
„ Benzoate		<i>antibilthic.</i>	Barium „		<i>muscular poison.</i>
„ Salicylate		<i>antipyretic.</i>	Silver „		<i>inert.</i>
„ Cyanide		<i>powerful poison.</i>	Iron „		<i>astringent, hæmatinic.</i>
			Mercuric „		<i>corrosive, antiseptic.</i>

A similarity of action is noticeable in some salts, which have different bases but the same acids; bromides and iodides of different metals. All nitrites act similarly.

(e) *Many drugs maintain a uniformity of action in whichever form they are administered, because they liberate common elements when they are broken up in the organism.* Thus, all mercurial preparations cause salivation.

2. The action of a drug is determined to a great extent by its affinity for certain class of tissues, or by its power of acting on certain organs and tissues. This selective action is observed in the pharmacology of almost every drug. Thus, amyl nitrite and nitroglycerin dilate the blood-vessels, ergot contracts them; atropine, hyoscyamine, and cocaine dilate the pupils; physostigmine, pilocarpine and morphine contract them.

The variation of action may be caused by many other influences besides the selective affinity; such as the varying rate of solubility, rate of osmosis, rate of absorption, rate of excretion, and the interaction of various functions.

The action of a drug may be either *direct* or *local*, or *indirect* or *remote*. It may also be either *primary* or *secondary*.

The direct or local action of a drug is what it exerts on a part or organ with which it comes directly in contact. Thus, caustic potash causes irritation and sloughing when applied to the skin, hence its *immediate local* action is irritant and caustic. Copaiba during elimination stimulates urinary cells and bronchial glands, hence its *remote local* action is diuretic and expectorant.

The indirect or remote action of a drug is what it exhibits after absorption, on different parts of the body through the nervous system. For example, apomorphine hypodermically injected causes vomiting by exciting the vomiting centre, and not by exciting the gastric nerves. This is shown by a simple experiment. After injecting the drug, if the vessels are so tied that it cannot circulate to the vomiting centre, no vomiting occurs; although it can reach the stomach. The immediate local action of aconite on the tongue is tingling and numbness, and its indirect or remote action on the heart is the slowing of its force and tension, due to the stimulation of the vagal roots.

The primary action of a drug is what is produced by it in its unaltered state ; e.g., the emetic action of tartar emetic, the stimulant action of alcohol, &c.

The secondary action is that caused by compounds formed in the body from the decomposition of a drug ; e.g. the conversion of rhubarb into chrysophanic acid in the body and consequent cure of psoriasis during a course of rhubarb treatment.

CLASSIFICATION OF DRUGS ACCORDING TO THEIR PHARMACOLOGICAL ACTIONS AND THERAPEUTIC USES

CLASS I.—DRUGS THAT ACT ON THE DIGESTIVE ORGANS.

A. Drugs that act on the tongue.

1. Drugs that influence the sensory apparatus of the tongue.—

Drugs that act on the sensory branches of the glosso-pharyngeal, lingual and chorda tympani, can be divided into the following groups :—

(a) *Acids* ; as vegetable and mineral acids, lemon, tamarind, vinegar, caymel, &c.

(b) *Aromatics* ; as dill, anise, fennel, cardamoms, coriander, nutmeg, cinnamon, ginger, cloves, peppermint, rosemary, spearmint, &c.

(c) *Aromatic bitters* ; as chamomile flowers, cascarrilla, orange peel, gentian, cusparia, chiretta, and serpentary.

(d) *Bitters* ; as aloes, calumba, cinchona, and its alkaloids, nux vomica, strychnine, quassia, salem, nim-bark, &c.

(e) *Demulcents* ; as acacia, linseed, almonds, starch, honey, figs, eggs, olive and almond oils, syrup, ice, isafghul, &c.

(f) *Nauseants* ; as asaetida and valerian.

(g) *Pungents or acids*, as capsicum, cubebs, mustard, black pepper, horseradish, &c.

(h) *Spirituuous substances* ; as alcohol in every form, chloroform, and ether.

(i) *Sweets* ; as sugar, glucoside, glycerin, honey, liquorice, manna, &c.

B. Drugs that act on the teeth and gums.

1. Dentifrices (see p. 68).—Chalk is an excellent basis for a tooth-powder. Charcoal scratches the enamel. Dentifrices may be grouped under the following heads : —

(a) *Antiseptic* ; which may contain quinine, carbolic acid, borax, or thymol. They prevent decomposition of food lodged either between the teeth or within a cavity.

(b) *Astringent* ; which may contain myrrh, rhatany, catechu, betel-nut, kino, or alum. Alum injures the teeth when continued for any length of time. These check bleeding and harden spongy gums.

(c) *Alkaline* ; which may contain chalk, soda, or magnesia. They act by neutralizing acidity.

2. Local anodynes are used to relieve toothache, which is generally caused by exposure of the tooth-pulp from destruction of the dentine. Opium, cocaine, strong carbolic acid, arsenious acid, creosote, menthol, chloral c. camphor, &c., are introduced into the cavity of the tooth by means of a pledget of cotton-wool, after the cavity has been cleaned. In the case of irritants and caustics, a second pledget should be introduced either alone or better soaked in a solution of gum mastiche in chloroform, to prevent them from touching the tongue and cheek.

C. Drugs that influence the secretion of the salivary glands.--Drugs that increase the flow of saliva are called **sialagogues**. Their action is dependent upon (1) the activity of the secreting cells, and (2) the rapidity of the flow of blood, so as to maintain a supply of material for secretion.

1. Drugs which increase the salivary secretion reflexly by exciting the periphery of afferent nerves.--These are sometimes called **reflex sialagogues**, and may again be subdivided into :--

(a) *Those which act by stimulating the gustatory and the glossopharyngeal nerves of the mouth.*—

All vegetable and mineral acids	.Ether Chloroform	Alcohol Acid salts	Acids or Pungents
---------------------------------	----------------------	-----------------------	----------------------

(b) *Those that act by stimulating afferent filaments of the vagus in the stomach ; as* nauseants and emetics, *e.g.* ipecacuanha and antimony.

Besides the remedial agents, mental emotion, sight, smell, &c., may reflexly stimulate the secretion of saliva.

2. Drugs which increase the salivary secretion either by acting on the periphery of the secreting nerves or on the secreting cells.--These are sometimes called **specific sialagogues** :—

Jaborandi	Iodine compounds	Mercurials	Tobacco
Pilocarpine	Muscarine	Physostigmine	

Many drugs, such as tobacco, mercury, potassium iodide, act both reflexly through the nerves of the mouth, and specifically through the glandular cells or nerves.

3. Drugs which increase salivary secretion by acting on the ganglionic cells.--Nicotine, &c., first excite, later inhibit salivary secretion.

4. Antisialagogues or Antisialics are drugs which lessen the secretion of saliva. They may do this in the following ways :—

(a) *By allaying irritation of the mouth and thereby depressing the irritated terminal ends of the afferent nerves.* As potassium chlorate, borax, astringent gargles, &c., which, by curing stomatitis, check excessive flow of saliva.

(b) *By reducing the excitability of the reflex centres or afferent nerves.* As opium and morphine.

(c) *By reducing the vascularity of the glands.* As physostigmine in large doses.

(d) *By paralysing the periphery of the secreting nerves.* The action of atropine is most marked in this respect. It paralyses the secreting nerve chorda tympani, and not the secreting cells, for after the secretion has

entirely stopped, stimulation of the sympathetic will induce a flow of saliva. Atropine cannot affect the vaso-dilator nerves.

Therapeutics.—The secretion of saliva is considerably lessened in fevers, Bright's disease, diabetes, belladonna and stramonium poisoning, &c., consequently dryness of the mouth and thirst are urgent symptoms. To relieve thirst, we use *refrigerant* drinks. By **refrigerants** we mean substances that are used to allay thirst and produce a feeling of coolness; as acidulated and effervescing drinks, juices of fruits, sherbets, acid salts, acetates and tartrates. If thirst is due to a deficiency of water or excess of solubles, especially sugar, salines, &c., in the blood irritating the thirst centre, opium relieves it, when other remedies fail.

When the mucous membrane of the mouth is irritated and inflamed, as in irritant poisoning, we use *demulcents* or substances which soothe and protect the surface (*see* p. 67).

D. Drugs which act on the stomach.—The stomach is the chief organ of digestion. For thorough digestion, the following factors are essential, *viz.*—(1) complete mastication, (2) due secretion of the gastric juice both in quantity and quality, (3) proper churning movements of the stomach, and (4) due absorption of the products of digestion. Now, it is our object in the following pages to discuss how far remedial agents can influence or modify the above normal processes. We have already noticed drugs that affect the functions of the masticatory organs and the salivary secretion.

1. Drugs which influence the gastric secretion.

(a) *Drugs which increase the secretion of the gastric juice* are called *stomachics*. They do so (1) reflexly by stimulating the nerves of the mouth; and (2) by stimulating the nerve-filaments and dilating the blood-vessels of the stomach: as all aromatic, bitter, pungent and spirituous substances (*see* p. 121). We have, therefore:—

Aromatic stomachics

Bitter stomachics

Pungent stomachics

Spirituous stomachics

Therapeutics.—Stomachics are used in dyspepsia and in the convalescent stage of many acute diseases. They act by improving the appetite and then increasing the flow of gastric juice.

(b) *Drugs which decrease the secretion of gastric juice.*—Alkalis and spirituous stomachics (it in large doses). Alkalis are largely employed before meals in certain forms of dyspepsia; when so administered they act by checking the continuous flow of the gastric juice, give the gland cells time to rest and after recuperation enable them to pour out normal juice. They are also used after meals, to relieve the acidity due to the presence of lactic and fatty acids. Lead, silver, zinc salts in small doses, opium, tannic acid and vegetable astringents as kino, catechu, &c., reduce vascularity and act as *gastric astringents* and indirectly as *gastric sedatives*.

(c) *Drugs that modify the composition of the gastric juice and the contents of the stomach.*

We have considerable control over the composition of the gastric juice, and the gastric contents as shown below :—

(1) *Drugs that increase the acidity of the gastric contents.*—As hydrochloric acid dilute after food.

(2) *Drugs that neutralize the acidity.*—These may be either (a) *direct antacids*, as alkalis ; or (b) *remote antacids*, as acetate, citrate and tartrate of soda and potash, which become converted into carbonates in the blood.

(3) *Drugs that supply the deficiency of gastric ferments.*—As pepsin and papain, alone or in combination with dilute hydrochloric acid.

(4) *Drugs that prevent fermentation and decomposition of the gastric contents.*—For this purpose, we use **antiseptics**, though with temporary benefit. Large doses are injurious. They are :—

Boric acid	Cresoto	Iodoform	Sulphurous anhydride
Carbolic acid	Carbon dry	Naphthol	Sodium hyposulphite
Bismuth salicylate	Eucalyptus	Salol	Sodium sulphocarbonate
Salicylic acid	Charcoal	Thymol	Cylin

2. *Drugs that dilate the gastric vessels.*—The vascularity of the stomach increases on the least irritation, especially in the presence of food. All stomachics except alkalis, and diluted mineral acids dilate the blood-vessels to a small degree, but there are many drugs which powerfully irritate the mucous membrane, and may therefore be called *gastric irritants*, as arsenic, iron, mercury, senega, squill, gamboge, digitalis, colchicum, veratrine, copaiba, guaiacum, &c.

3. *Drugs that contract the gastric vessels.*—Gastric astringents do this, but their use is more confined to the intestine than to the stomach.

4. *Drugs that influence the gastric nerves and muscles.*

(a) *Drugs which increase the flow of the gastric as well as the churning movements of the stomach*, without producing those peculiar movements which cause emesis, are called *gastric stimulants*, or *gastric or stomachic tonics*. As mineral acids, strychnine, ether, volatile oils, &c.

Therapeutics.—Stomachic tonics are used in atonic dyspepsia, especially dilute nitro-hydrochloric acid with nux vomica and calumba.

(b) *Drugs which depress the gastric nerves and muscles.*—They may be either *direct or local* and *indirect or remote* :—

(1) *Direct or local Gastric Sedatives.*—These drugs directly soothe the irritable gastric nerve-filaments by their local action. They are :—

Ice	Hot water	Belladonna
Bismuth salts	Opium	Hyoscyamus
Hydrocyanic acid dilute	Morphine	Stramonium
Carbonic acid		

(2) *Indirect or remote Gastric Sedatives*.—These remedies soothe gastric irritation by reflexly depressing the afferent nerves through the nerve-centres. (See *Counter-irritants*.) They are :—

Blisters	Morphine	} hypodermically	Hydrocyanic acid dilute.
Fomentations	Chloroform		
Poultices	Opium		

Opium is very powerful in this respect. The last two are local as well as remote gastric sedatives.

There are a few gastric sedatives whose action is not yet known, such as cerium oxalate, ipecacuanha wine and tincture of iodine in drop doses.

(c) *Drugs that help the expulsion of gas from the stomach and bowels*.—These are called **carminatives** (*carmino*, I soothe). They appear to act (1) by exciting healthy and regular peristaltic movements of these organs, (2) by dilating either the cardiac or sometimes the pyloric sphincters, and (3) by stimulating the gastro-intestinal nerves and muscles. As a result of these actions, there is either *eructation* or a discharge of flatus by the anal aperture. They are :—

Aromatics (see p. 121)	Asafetida	Valerian
Aromatic bitters (see p. 121)	Camphor	Spirits
Ammoniacum	Pungents	Volatile oils

Of these, aromatics and spirituous substances are the most effective.

(d) *Emetics*.—Vomiting is a complex physiological phenomenon, to produce which several parts are brought into play. The chief of them is the vomiting centre in the medulla and the afferent stimuli brought from various sources. *Emetics* are drugs which produce vomiting. They are generally divided into *direct* and *indirect*. By the former, we mean those that act only when they are introduced into the stomach ; by the latter, those that act by stimulating the vomiting centre after introduction into the blood. Such a classification is erroneous, as emetics cannot act when introduced into the stomach, except by reflexly stimulating the vomiting centre. Therefore, they should better be divided into *local or gastric*, and *remote or central*.

(1) *Local or Gastric Emetics*.—These are known to cause vomiting, as long as they keep up their action on the gastric nerves, and to stop it, as soon as they are evacuated, or carried into the general circulation. No depression follows from their use. They are :—

Zinc sulphate	Ammon. carbonate	Mustard	Warm water (in large draughts).
Alum	Copper sulphate	Common salt	

(2) *Remote or Central Emetics*.—These act by stimulating the vomiting centre, through the circulation after absorption. They take a longer time to act, and are accompanied by nausea, salivation, sweat, secretion of mucus from the air-passages and œsophagus, and depression. As apomorphine, ipecacuanha, tartar emetic, squill, senega, tylophora,

(3) *Gastro-Central Emetics*.—Drugs of this class act by stimulating the gastric nerves as well as the vomiting centre ; as ipecacuanha and tartar emetic.

Therapeutics.—Emetics are indicated :—

- (i) To remove foreign bodies impacted in the throat and œsophagus.
- (ii) To expel undigested substances and poisons.
- (iii) To remove false membranes or excessive bronchial secretion.
- (iv) To aid the action of antiperiodics.

They are contra-indicated in hernia, aneurism, prolapse of the rectum and uterus, peritoneal and intestinal inflammation, and in cases where there is a tendency to hæmorrhage, atheroma of blood-vessels or abortion.

(e) *Antiemetics* are drugs which stop vomiting either by acting locally on the stomach, or centrally on the vomiting centre. They may therefore be divided into :—

(1) *Direct or Gastric Antiemetics*.—These stop vomiting by their direct sedative action on the gastric nerves. They are :—

Alcohol (in small doses)	Carbolic acid	Hot water	Morphine
Arsenious acid	Carbonic acid	Hydrocyanic acid	Opium
(in small doses)	Chloroform	Ipecacuanha wine	Silver nitrate
Bismuth salts	Cerium oxalate	(in 1 m. doses)	Sulphocarbolate
Calomel (in small doses)	Cocaine	Ice	
	Cresote	Iodine (Tr. in 1 m. doses)	
	Ether		

(2) *Remote or Central Antiemetics*.—These act by removing the irritation of other structures or organs, besides that of the stomach and the nerve centres ; vomiting caused by the passage of a calculus through the ureter or gall-duct, or strangulated hernia, is an example of reflex or central vomiting. They are :—

Opium	Chloral hydrate	Nitroglycerin
Morphine	Hydrocyanic acid dilute	Amyl nitrite
Bromide salts	Alcohol (in small doses)	

Therapeutics.—Remove the cause. Ice, hydrocyanic acid dilute, ipecacuanha wine, bismuth salts, carbonic acid, &c., are ordinarily used, and are the best local antiemetics. For reflex vomiting, opium and morphine are reliable.

E. Drugs that act on the duodenum.—We have not so much control over this part of the digestive tract as we have over the stomach. The normal chyme slightly acid in reaction is subjected here to a further digestive process by the alkaline secretions from the liver, ⁴¹ pancreas, and the intestinal glands. Drugs which aid duodenal digestion can be divided into the following two groups :—

1. *Direct duodenal stimulants*.—By increasing the acidity of the chyme towards the end of the gastric digestion, by diluted hydrochloric, nitric, nitro-hydrochloric or phosphoric acids, we can aid or stimulate the alkaline secretions in the duodenum.

One of the most important actions of acids in the alimentary canal is the way in which they excite pancreatic secretion. Ether also stimulates the pancreatic secretion and probably emulsifies fats and oils. Indirect cholagogues, such as calomel, increase the flow of bile already secreted, by acting as a duodenal purgative.

2. *Remote duodenal stimulants*.—Sialagogues, stomachics and purgatives, indirectly stimulate the duodenal digestion, by transmitting into the duodenum chyme having a greater acidity.

F. Drugs that act on the intestine.—In order to understand how remedies act on this part of the alimentary canal, the student must refresh his memory as regards the physiology of intestinal digestion. The chyme after transmission into the small intestine is further subjected to the digestive processes, and the chyle and other soluble constituents are absorbed by the lacteals and portal veins as the chyme is propelled downwards by the intestinal movements, known as **peristalsis**. Absorption is carried on by *osmosis* or diffusion, and excretion partly by osmosis and partly by the glands, which furnish the *succus entericus*. The excretion particularly of the watery portion is so profuse, that the effect of absorption is neutralized, and the contents of the small intestine and the duodenum remain liquid. In addition to this certain benign micro-organisms, whose normal habitat is the intestinal tract, play an important part in intestinal digestion. They may occasionally give rise to toxins and so produce symptoms of considerable gravity. The muscular coat is supplied by the *vagus* and *splanchnics*; the former increases peristalsis, and the latter restrains or inhibits it, just as the *vagus* does with the heart. Although these nerves maintain a connexion with the brain and spinal cord, yet independently of them, as is seen when the entire nerve-supply is cut off, automatic movements may continue, which are due to the ganglia in the intestinal coats.

Four classes of remedies are known to affect the intestinal functions, viz.—(1) **purgatives**, (2) **intestinal astringents**, (3) **gastro-intestinal irritants** and (4) **antiseptics**.

1. Drugs that increase the secretion and peristaltic movements.—These drugs cause evacuation from the intestine, and are known as **purgatives**, **aperients** or **evacuants**. They can be divided into the following groups according to the degree and the manner of their action :—

(a) *Laxatives*.—These produce soft motions with a slight increase of peristalsis. They are :—

Bran bread	Figs	Sulphur
Bran biscuits	Tamarinds	Magnesia
Fresh vegetables	Prunes and	Castor oil
Honey	Stewed apples	(in small doses)
Treacle	Manna	Almond oil
Fruits as—	Cassia	Olive oil

Besides those mentioned above, *nux vomica*, *belladonna*, *hyoscyamus*, *stramonium*, *ergot*, *physostigmine* act as laxatives under certain conditions, but they are not ordinarily used as such. *Opium* and *belladonna* in very minute doses (tincture m. 1) paralyse the inhibitory fibres of the splanchnics and increase peristalsis and thus act as purgatives.

(b) *Simple purgatives*.—These are somewhat stronger than laxatives. They increase both the secretion and the peristalsis though mildly. As *aloes*, *senna*, *castor oil*, *fel bovinum*, *rhubarb* and *casarea sagrada* in large doses, *magnesia*.

(c) *Drastic purgatives*.—These are sometimes called **cathartics**. They cause large fluid motions with considerable griping and mucous discharge. In large doses they violently irritate the bowels producing mucous diarrhoea, griping (due to irregular contractions), collapse and even hæmorrhage. *Hyoscyamus*, *belladonna*, *Indian hemp* and aromatics correct their griping properties. They are :—

Croton oil	Gamboge	Colocynth
Elatarium	Kaladana	Podophyllum
Scammony	Turpeth	Jalap

Many drastic purgatives produce a free and copious secretion from the intestinal glands, thereby abstracting much serum from the blood. They are therefore called **hydragogues** ; as *jalap*, *scammony*, *elaterium*.

(d) *Saline purgatives*.—These cause liquid or watery motions by increasing the intestinal secretion and hindering its reabsorption. The fluid then accumulates in the bowels and by distending them excites gentle peristalsis, and so causes an easy painless motion. If concentrated solutions of salines are used, the secretion of fluid is excessive and these purgatives then act as hydragogues. They are largely used by persons suffering from the gouty diathesis. They are *magnesium sulphate*, *pot. acid. tartrate*, *sod. tartrate*, *sodium sulphate*, *pot. tartrate*, *sodium phosphate*, *sod. citro-tartrate*, purgative mineral waters, as *Hunyadi János*, *Pullna*, *Friedrichshall*, *Carlsbad*, &c.

(e) *Cholagogue purgatives*.—These purge either by stimulating the liver and increasing the biliary secretion, or by exciting the peristalsis of the duodenum and small intestine, and thus hindering the re-absorption of the bile secreted. They produce greenish stools. They are :—

Calomel	Podophyllum	Grey powder	Rhubarb
Blue pill	Euonymus	Aloes	Drastic purgatives (some)

Therapeutics.—Purgatives are used :—

- (1) To remove fæcal accumulation.
- (2) To drain serum from the blood in the case of cardiac, renal and hepatic dropsy.
- (3) To lower the temperature in fevers.
- (4) To lower the blood pressure in apoplexy and cerebral congestion.

(5) To prevent straining in persons suffering from piles, aneurism or hernia.

(6) To expel bile and help the passage of biliary calculi.

(7) To remove from the blood certain excrementitious matters, such as urea, uric acid, &c.

2. Drugs that decrease the secretion and the peristaltic movements of the intestine.—These are called **intestinal astringents**, and may be subdivided according to their mode of actions under the following heads :—

(a) *Intestinal astringents that act by contracting the vessels.*—They are alum and lead salts, silver salts (in dilute solutions) and sulphuric acid dilute.

(b) *Intestinal astringents that act by coagulating albuminous tissues supporting the vessels.*—These are also called *intestinal constringents*. They are :—

Ferrie salts	Bismuth salts	Catechu	Krameria
Copper „	Tannic acid	Cinnamon	Eucalyptus gum
Zinc „	and substances	Kino	Hæmatoxyli
Lead „	containing it, as		

(c) *Intestinal astringents that act by reducing the glandular secretion.*—They are lead, calcium salts and opium.

(d) *Intestinal astringents that act by diminishing the peristalsis.*—They are opium, stramonium, lead salts, belladonna, hyoscyamus, hinc and bismuth salts (?).

Therapeutics.—Intestinal astringents are employed to check diarrhœa. If it is due to offending matters or impacted feces, a laxative or a simple purgative, such as castor oil or Gregory's powder, should be given.

3. Drugs that produce gastro-intestinal irritation.—These are known as **gastro-intestinal irritants**. Many irritant poisons are given in minute doses therapeutically, but if they are swallowed in large doses a train of symptoms is produced which are known as toxic actions. Thus, if the irritant is caustic or corrosive, it causes burning and pain in the lips, mouth, pharynx and œsophagus. These parts soon inflame and become red and swollen. On reaching the stomach, it sets up intense irritation, causing severe vomiting and retching, accompanied by severe abdominal pain and tenderness. As it is transmitted into the intestine, it causes the same irritation as in the stomach, accompanied by diarrhœa. The vomiting and purging may commence so suddenly that the symptoms may be mistaken for those of cholera. The vomit and stools often contain blood. General prostration, vascular depression and collapse are the chief general symptoms. If the patient survives for a few days, peritonitis, gastric or intestinal ulcers, or stricture of the œsophagus may follow ; but if the patient dies soon after swallowing the poison, at the autopsy the

mucous membrane of the stomach and intestines is found red, ecchymosed and swollen.

Certain irritant poisons, such as phosphorus, give rise to secondary toxic symptoms some time after the cessation of the primary ones.

4. Intestinal antiseptics.—These are occasionally used to prevent fermentation of the intestinal contents, or absorption of septic matters. Many however doubt their efficacy. (*See p. 124.*)

G. Drugs that act on the entozoa infesting the human alimentary canal.

1. Anthelmintics are drugs which kill or expel the intestinal worms. They are of two kinds, **direct** or **indirect**.

A. Direct anthelmintics may again be subdivided into the following two groups :—

(1) *Vermifuges* (*vermis*, a worm, and *fugo*, to expel) are those drugs, which simply expel, or drive out worms without necessarily killing them ; as jalap, scammony, gamboge, &c.

(2) *Vermicides* (*vermis*, a worm, and *cædo*, to kill) are those drugs which kill intestinal entozoa. These drugs may again be subdivided according to their actions on the different varieties of entozoa. Thus we administer :—

(a) For round-worm (*Ascaris lumbricoides*), santonin.

(b) For thread-worm (*Oxyuris vermicularis*), rectal injections of a solution of common salt, strong infusions of quassia or calumba, solutions of ferric salts, and decoctions of aloes.

(c) For tape-worm (*Tænia solium* and *T. mediocanellata*), male fern, cusso, pomegranate root-bark, melon-pumpkin seeds, embelia, kamala, and areca nut.

(d) For duodenal worm (*Ankylostomum duodenale*), thymol, and eucalyptus oleum.

B. Indirect anthelmintics.—These act by improving the general condition of the mucous membrane and lessening the secretion of mucus, which acts as a protecting medium for and encourages the growth of worms. As iron salts, bitter tonics especially quassia and calumba.

H. Drugs that act on the liver.—The functions of the liver are but imperfectly understood. In short, it is a doorkeeper to the circulation. However, it is known to perform the following specific actions, *viz.*—(1) the formation and secretion of bile ; (2) the excretion of bile ; (3) the conversion of carbohydrates and some portion of proteids into glycogen ; (4) the storing of glycogen and its reconversion into sugar ; (5) the destruction or storing up and the excretion of organic poisons formed in or introduced from without into and absorbed by the intestine, and (6) the production of urea and uric acid. In the present state of our knowledge we cannot influence all the above functions. Those that we can, are given below :—

1. Drugs that influence the secretion of bile.—Drugs which increase the flow of bile, are called **cholagogues**. They are either *direct* or *indirect*. *Hepatic stimulants*, properly speaking, are drugs which increase the functional activity of the liver, which includes, no doubt, the increased amount of bile formed and secreted.

(a) *Drugs which are supposed to increase the secretion of bile* are called *direct cholagogues*. Sometimes they are erroneously called hepatic stimulants. They are :—

Podophyllum	Nitric Acid dil.	Ammon. chloride
Euonymus	Sodium salicylate	Colchicum
Iridin	„ benzoate	Colocynth
Ipecacuanha	„ phosphate	Rhubarb
Aloes	„ sulphate	Hydrastis
Acid. nit -hydrochlor. dil.	Mercuric chloride	

Antim. sulphurate

Potass. sulphate

Jalap

Scammony

Baptisin

Dilute arsenious acid

Of these, sodium salicylate makes the bile watery. Podophyllum and iridin increase the solid ingredients of the bile.

(b) *Drugs that only increase the excretion of the already formed bile, by the increased peristaltic action of the lower part of the duodenum and the upper part of the jejunum.*—These cause the bile to be rapidly swept along the intestine without allowing time for its re-absorption. These drugs are called *indirect cholagogues*. As mercurials and many cathartics.

Therapeutics.—All cholagogues are purgatives (*see* p. 128), because the bile stimulates the peristaltic action of the bowels. In hepatic disorders, such as biliousness, jaundice, hepatic dyspepsia, cholagogues are very useful, especially if the direct and indirect ones are combined together.

(c) *Drugs which lessen the quantity of the bile secreted* are called *anticholagogues* or *hepatic depressants*. As opium, morphine, codeine, bad acetate, magnesium sulphate, calomel, castor oil, gamboge, &c. Therapeutically they are never used.

(d) *Drugs that are used to dissolve gall-stones* may be called *biliary lithontriptics*.—Our knowledge of this class of drugs is very slight. Sodium salicylate may do good by increasing the fluidity of bile. Durand's remedy (ether 3, oil of turpentine 2), olive oil, glycerin, soap, Carlsbad mineral water are said to dissolve, expel or reduce the size of the stone.

2. Drugs that influence the glycogenic function of the liver. They are :—

(a) *Glycogenic stimulants.*—As amyl nitrite, dilute nitro-hydrochloric acid and sodium bicarbonate.

(b) *Glycogenic depressants*.—As antimony, arsenic, phosphorus, opium, morphine and codeine.

3. Drugs that influence the formation of the urea in the liver.—It is believed that lactate of ammonia and amido-acids, *e.g.* leucin, a nitrogenous derivative, are converted into urea in the liver. It is also believed that phosphorus, arsenic, antimony, ammonium chloride and iron *increase* the quantity of urea excreted in the urine; but they are never used therapeutically for this purpose. On the other hand, opium, morphine, colchicum, alcohol and quinine are believed to *decrease* the quantity of urea excreted in the urine.

I. Drugs acting on the Pancreas.—The pancreatic secretion is stimulated by fats and acids and diminished by alkalis. The stomachics and dilute mineral acids by increasing the flow of gastric juice excite secondarily an increase of pancreatic secretion.

CLASS II.—DRUGS THAT ACT ON THE RESPIRATORY SYSTEM

There is an intimate relation between the respiratory organs and the external air, the blood, the circulation, the nervous system and the respiratory centre. A disturbance in any of them at once reflects upon the respiratory mechanism. For example, if the air inhaled is of abnormal pressure and temperature, or is deficient in quality or quantity, the respiratory functions are interfered with. If the condition of the red blood corpuscles which are the oxygenating elements of the body is altered, the respiratory activity is at once affected. This is also the case if the circulation and the functions of the afferent nerves of the respiratory and other organs are modified. The object, therefore, is to remove the cause of the respiratory difficulty, either by influencing the external air, by stimulating the respiratory centre, or by depressing the centre against afferent impressions. Hence, drugs acting on the respiratory apparatus may be arranged under the following heads:—

A. Drugs that are inhaled with the air.—(Chloroform and other are inhaled diluted with air to produce general anaesthesia, but there are other groups of drugs which can be inhaled in the same manner to produce definite actions as given below.—

1. *Stimulant Inhalations*.—These increase the vascularity, muscular activity and secretion from the bronchial tubes. They are carbolic acid 20 grs., cajuput oil 20 ms., fir-wool oil 5 ms., creosote 30 ms., cubebs $\frac{1}{2}$ oz. and Tr. benzoin co. $\frac{1}{2}$ oz. The doses indicate the quantities to be added to a pint of water at temperature 140° F. Fir-wool oil should be triturated with mag. carb. levis 2 $\frac{1}{2}$ grs. and water 1 dr., and added to $\frac{1}{2}$ pint of warm and $\frac{1}{2}$ pint of cold water.

2. *Irritant Inhalations*.—These cause irritation of the bronchial mucous membrane; as chlorine, bromine, iodine, powdered senega, sulphurous anhydride, ammonia, nitric acid fumes, tobacco, &c. They are never used therapeutically.

3. *Sedative Inhalations*.—These allay or soothe the irritation of the bronchial mucous membrane; as hydrocyanic acid dilute and conium. They are rarely employed.

4. *Antispasmodic Inhalations*.—These relieve bronchial spasm; as chloroform, ether, amyl nitrite, smoke of stramonium, nitre-paper, a mixture of nitre and chlorate of potash, lobelia, belladonna, &c.

5. *Antiseptic Inhalations*.—These disinfect and deodorize foul bronchial secretions; as eucalyptus oil, terebene, creosote, carbolic acid, iodoform, sulphurous anhydride, juniper oil, cubebs oil, pumiliac and solution of benzoïn.

B. Drugs that act on the nose.

1. *Stimulators or Errhines* are drugs which cause sneezing and increase the secretion of the nasal mucous membrane, when locally applied. They are, tobacco (snuff), capsicum, ginger, black pepper, &c.; ipecacuanha, guaiacum, senega, and white hellebore, in powder.

Therapeutics.—These are sometimes used (a) to expel foreign bodies from the air-passages, (b) to remove headache, (c) to check hæmorrhage. They are contra-indicated in cases where there is a tendency to pulmonary or cerebral hæmorrhage, hernia, prolapse of the uterus and rectum, and in atheroma of the blood-vessels.

2. *Nasal sedatives* are drugs which remove irritation of the nasal mucous membrane. They may be either *local*, as bismuth salts alone, or with morphine, cocaine, &c., or *general*, as pulv. ipecac. co., aconite, &c.

Therapeutics.—Ordinary nasal catarrh often yields to nasal sedatives, but infectious coryza due to hay fever or influenza, may require an antiseptic nasal douche, spray, insufflation or gargle.

3. *Nasal astringents* are drugs which check epistaxis and excessive secretion of mucus from the nasal mucous membrane, when locally applied. They are alum, tannic acid, hamamelis, ferri perchlorid., ice, &c.

4. Drugs that act on the olfactory apparatus.—

(a) *Drugs that stimulate the olfactory nerves*.—The pungent vapours of certain drugs, such as ammonia and acetic acid, stimulate the terminal ends of the olfactory nerve and reflexly stimulate the vaso-motor and cardiac centre.

(b) *Drugs that depress the terminal ends of the olfactory nerves*.—Drugs which possess very powerful odours, such as musk, asafoetida and ethereal oils, first stimulate the olfactory terminations, and then after a while depress them, so that the smells cannot be perceived with the same degree of intensity. Anosmia can also be induced by such substances as cause acute and chronic alterations in the nasal mucous membrane, e.g. potassium iodide, snuff (tobacco), and irritant inhalations (*see above*).

C. Drugs that influence the respiratory centre.—The chief respiratory centre is situated at the tip of the calamus scriptorius in the medulla, at a point called *œnœd vital* by Flourens, the destruction of which stops breathing and causes death. The vagal centre almost coincides in position with this spot. Properly speaking, this point

forms the centre of a circle, within which the respiratory impulses originate. The vagus is the chief nerve of respiration, containing both sensory and motor fibres, and it therefore plays a most important part in respiratory functions. The afferent filaments which abundantly supply the whole of the air-passages and probably the lungs, constantly transmit impressions to the centre, and incessantly modify respiratory movements. Again the muscles of the bronchi being supplied with efferent fibres of the vagus, are constantly affected by various afferent impressions, which may even arise in the air-tubes themselves. Besides the vagus, there are other nerves which also influence the expiratory and inspiratory movements. We infer that a drug acts directly upon the respiratory centre (1) if it very quickly produces its effect in respiration when it is injected into the carotid artery, (2) if its effect on respiration is not altered by section of the vagi.

1. Drugs which directly increase the activity of the respiratory centre are :—

Strychnine	Ammonia	Stramonium	Digitalis	} briefly.
Atropine	Apomorphine	Hyoscyamus	Emetine	

Of these strychnine, atropine and ammonia are very powerful.

2. Drugs which directly depress the activity of the respiratory centre are :—

Opium	Chloral	Ipecacuanha *	Gelsemium
Codeine	Alcohol *	Ether *	Saponine
Hydrocyanic acid	Aconite	Chloroform *	Antimony
Conium	Veratrine	Caffeine *	salts *
Physostigmine	Virg. Prune	Quinine *	Heroin

Those with * excite slightly before depressing. Physostigmine is very powerful, but is never used therapeutically for this purpose. Opium, codeine, hydrocyanic acid dilute, conium and virginian prune are ordinarily used.

Therapeutics.—Direct stimulants to the respiratory centre are used to increase the force of the respiratory act and thus to overcome respiratory difficulty, as in bronchitis, pneumonia, phthisis, opium and chloral poisoning, &c. Direct sedatives to the respiratory centre, especially opium, codeine, hydrocyanic acid dilute are often prescribed to allay cough reflexly set up by the irritation of the lungs, stomach, liver, spleen, pleura, trachea, bronchi, larynx, nose, pharynx and oesophagus.

D. Drugs that influence the bronchi and the lungs.

1. Drugs that stimulate the afferent nerves are the irritant inhalations (*see* p. 132), and ipecacuanha and antimony internally.

2. Drugs that depress the afferent nerves are the depressants of the respiratory centre (*see* above).

3. Drugs that affect the bronchial glands.

(a) *Drugs that increase the bronchial secretion are :—*

Alkalis (especially ammon. carb.)	Squill	Terebene	Balsam of Peru
Iodine	Ipecacuanha	Turpentine	Balsam of Tolu
Quillaia	Benzoin	Volatile oils	Copaiba
Apomorphine	Antimony salts	Asafetida	Onion
Senega	Camphor	Tobacco	Garlic
	Jaborandi	Sulphur	Urginea

(b) *Drugs that diminish the bronchial secretion are acids (powerful), belladonna, stramonium, hyoscyamus.*

(c) *Drugs that disinfect the bronchial secretion are the antiseptic inhalations (see below), and copaiba, cubebs, ammoniacum, volatile oils and oleo-resins internally.*

(d) *Drugs that stimulate the nervo-muscular tissues of the bronchi are those which excite the afferent nerves (as drugs in D., No. 1).*

(e) *Drugs that depress the nervo-muscular tissues of the bronchi and thereby relieve bronchial spasms are called bronchial antispasmodics. These may be either (1) antispasmodic inhalations (see p. 133), (2) depressants to the respiratory centre (see p. 134), (3) expectorants (see below), or the following :—*

Stramonium	Sodium nitrite	Tobacco	Cannabis Ind.
Lobelia	Nitroglycerin	Ether	Adhatoda
Belladonna	Grindelia	Opium	
Amyl nitrite	Chloroform	Ethyl iodide	
Hyoscyamus	Chloral	Conium	

Therapeutics.—Respiratory spasms are instantly relieved by amyl nitrite, nitroglycerin and sodium nitrite, but they quickly return. Narcotics, such as opium, cannabis Indica, chloral hydrate, being powerful respiratory depressants are objectionable, though they may relieve spasms. Potassium iodide, stramonium, lobelia, spirits of ether, chloroform, ammonia and grindelia are ordinarily used with success in asthma. Atropine hypodermically sometimes relieves when others fail. Smoking stramonium or nitre-papers, &c., affords only temporary relief. If dyspnoea is caused by dyspepsia, gout, constipation, &c., remove the cause.

(f) *Drugs that act on the bronchial circulation.*—All remedies which stimulate the general circulation, such as digitalis, squill, alcohol, ammonia, strychnine, aromatic oils, &c., *increase the circulation of the bronchi.* All cardiac and general vascular depressants, such as aconite, antimony, ipecacuanha, iodides, alkalis, *diminish the bronchial circulation.*

E. Expectorants are remedies which facilitate the expulsion of the sputum. According to their mode of action, they may be grouped under the following heads :—

1. *Antiphlogistic or depressant Expectorants*.—These increase the secretion, by subduing inflammation of the bronchial mucous membrane; as nauseants and emetics in small doses, e.g. ipecacuanha, tylophora, antimony, apomorphine, lobelia, potassium iodide.

2. *Stimulant Expectorants*.—They are of two kinds, viz. (a) those that stimulate the secretion of the bronchial glands during elimination; as (in D., 3 (a) p. 135), and (b) those that stimulate the respiratory centre and strengthen the expulsive muscles; as strychnine and atropine.

3. *Sedative Expectorants*.—These act by diminishing the irritability of the respiratory centre, or of the tracts of afferent impulses; as opium, e.g. pil. ipecac. c. scilla, tr. camph. co., tr. opu ammon., pulv. ipecac. co., morphine, codeine, and chloral hydrate.

4. *Mechanical Expectorants*.—These forcibly expel the sputum during the act of vomiting; as ipecacuanha, antimony, and ammonium carbonate which also liquefy the secretion; or zinc sulphate if they fail.

5. *Antispasmodic Expectorants*.—These act by relaxing bronchial spasms; as bronchial antispasmodics (see p. 135).

6. *Saline Expectorants*.—These increase the fluidity and alkalinity of the sputum; as alkalis and alkaline salts, especially potassium bicarbonate and ammonium chloride.

7. *Antiseptic Expectorants*.—Many substances, such as tar, terebene, pine-oil, sulphur, iodine, aromatic oils, balsams, and oleo-resins, are excreted by the bronchial mucous membrane, thus disinfecting and deodorizing the mucus, the flow of which is increased.

8. *Reflex Expectorants*.—These promote expectoration by reflex action through impressions produced in the mouth, as potassium chlorate, gum acacia, sugar candy, sodium chloride (native crystal), when sucked.

F. Anti-Expectorants are drugs which diminish the amount of water of the sputum and thus dry up the secretion; as acids, iron, atropine and opium.

Therapeutics.—The indications for the use of expectorants have been fully detailed above. The student must be careful how he prescribes narcotics which are very powerful depressants of the respiratory and other centres. Inhalations of warm moist air, warm poultices to the chest, warm liquid food, demulcent gargles (see p. 71) are very useful adjuncts. If the secretion is excessive, acids, iron, bracing fresh air are useful.

CLASS III.—DRUGS THAT INFLUENCE THE BLOOD

A. Drugs that act on the liquor sanguinis or plasma.—The liquor sanguinis being the medium of nutrition as well as the carrier of the products of metabolic processes, any disturbance in its composition directly affects the nutrition and the vital activity of the tissues and organs. We can modify the constituents of the plasma either by food, drugs, transfusion or abstraction of blood.

1. *Drugs that increase the alkalinity of the plasma* are:—

Potassium salts	Lithium salts	Ammonium salts	Alkaline mineral
Sodium	„	Calcium	„
		Magnesium	„
			waters

Of these, the action of the potassium salts is rapid and powerful but not so lasting; and that of the sodium salts slow and weak, but more permanent. With uric acid they form soluble urates, which are eliminated by the diuretic action of the alkalis.

2. *Drugs that decrease the alkalinity of the plasma.*—The liquor sanguinis is normally alkaline, and cannot be made acid, for acid plasma cannot maintain life. But we can diminish its alkalinity by acids, especially the organic acids, as benzoic acid.

3. *Drugs that modify the composition of the plasma by the abstraction of water and salts.*—Purgatives, diuretics and diaphoretics remove much serum and salts from the plasma and thus materially alter its composition. Transfusion (see p. 103) and venesection directly affect it.

Therapeutics.—Alkaline salts are largely employed in rheumatism, gout and lithiasis. Potassium citrate is ordinarily used in lithiasis, as it does not derange digestion. Purgatives, diuretics and diaphoretics indirectly help the absorption of effusions and dropsical swellings of all kinds, as well as the removal of poisons circulating in the blood, as in uræmia.

B. Drugs that influence the blood corpuscles.

1. *Drugs that act on the red blood corpuscles.*—Healthy red blood corpuscles contain a uniform amount of hæmoglobin. Iron is its chief constituent. Drugs which improve the quantity and quality of hæmoglobin when deficient are called **hæmatics** or **hæmatinics**. Of course, these actions refer to pathological conditions of the blood, for the amount of hæmoglobin in healthy blood cannot be increased to any appreciable extent.

(a) *Direct hæmatics* are drugs which directly increase the amount of hæmoglobin as well as the number of red corpuscles. Iron and its various preparations are the most powerful. Next to them is arsenious acid. Potassium permanganate, phosphorus, salts of copper and potassium are doubtful in their action.

(b) *Indirect hæmatics* are those remedial agents which act by removing the cause of the anaemia. Thus, quinine and mercury, by curing the original disease, indirectly remove the anaemia of malarial fevers and syphilis respectively. Cod-liver oil aids assimilation and removes blood dyscrasia, whilst fresh air, sunlight, nutritious food, outdoor exercises improve digestive powers. In this way they indirectly act as hæmatinics.

(c) *Drugs that affect the red corpuscles generally.*—Certain drugs, such as arsenious acid, phosphorus, iodine, sulphur, oil of turpentine, hydrocyanic acid, reduce *oxyhæmoglobin*, and thus impair its oxygenating power, if given in lethal doses. Citrates, acetates and tartrates of the alkaline metals are converted into carbonates at the expense of the oxygen of the hæmoglobin. Alcohol and quinine bind

oxygen so firmly to the hæmoglobin, that its oxygenating property is impaired. Carbonic acid, quinine and morphine are said to reduce the size of the red corpuscles, and hydrocyanic acid and oxygen to increase it. Mercury in small doses increases their number. Nitrite of amyl, sodium nitrite, nitrous ether, phenazone, acetanilide, and phenacetin convert a portion of hæmoglobin into *methæmoglobin* in full doses. Pyrogallie acid and potassium chlorate destroy red corpuscles.

Therapeutics.—Both direct and indirect hæmatinics are employed in anæmia, but the rational method of treatment is to ascertain and remove the cause of the disease. Direct hæmatics are only to be given when the digestive functions and powers of assimilation are in working order.

2. Drugs that affect the white blood corpuscles.

(a) *Drugs that arrest the migration of the white corpuscles.*—The white corpuscles are migratory in their habit. If an inflammation is set up by an irritant or disease, they wander through the capillary walls. Quinine, quinidine, cinchonidine, and other cinchona alkaloids arrest this migration. Quinine is also known to reduce their number, and veratrine kills them if applied outside the body.

(b) *Drugs that increase the production of white corpuscles.*—Aromatics, chiefly camphor and myrrh, increase their production, probably by stimulating their absorption from the intestinal canal. Pilocarpine also is said to increase their number.

3. Drugs that alter the coagulability of the blood.

(a) *Those that increase it.*—Carbonic acid, calcium chloride or lactate, magnesium carbonate or lactate, phosphoric acid and soluble phosphates, thymus glands, strontium carbonate or lactate and milk.

(b) *Those that diminish it.*—Oxygen, alcohol, citric acid, rhubarb, acid fruits, acid wines, starvation, large quantities of fluid.

C. Drugs that act generally on the blood.—There are many drugs which cannot be grouped under any of the above heads, as their actions have not yet been thoroughly defined. Thus, cod-liver oil increases the solid constituents of the blood. Potassium iodide and calcium salts increase its coagulability. Mercurial salts in toxic doses reduce the solids, diminish the coagulability and increase the fluidity.

CLASS IV.—DRUGS THAT INFLUENCE THE HEART AND ITS MECHANISM

The heart is a peculiarly constructed nervo-muscular organ, performing complex functions. It is capable of originating spontaneous rhythmical movements. The theory that these movements are due to the ganglia located in the heart is no longer believed, but evidence goes to prove that they *originate from the spontaneous impulses generated*

in the muscular fibres of the heart, and not in the nerves and ganglia. Though the muscular fibres spontaneously contract, yet they can be normally controlled and regulated by the nerve centres. Two centres control the cardiac mechanism, viz.—the **cardio-inhibitory** and the **accelerator**. Afferent impressions from various parts of the body, including the seat of mind and the heart are transmitted to the centres in the medulla, to be reflected to the heart. Two sets of nerves perform this function. The vagus which contains both afferent and efferent nerves not only carries the afferent impressions from the heart, lungs, &c., but inhibits the heart's action. The accelerator nerve arising from the accelerator centre (no definite position is known), forms a part of the sympathetic, and augments the action of the heart.

When the physiology of the heart is so complicated, our knowledge of drugs acting on the heart must necessarily be very imperfect.

A. Drugs that modify the action of the heart.—It is not easy to determine whether a drug acts on the muscular fibres, or on the nerve-filaments. Though the apex of the heart is supposed to be free from nerve-fibres, yet it is difficult to prove their complete absence. However, if a drug acts on the excised apex, it is concluded that it acts on the muscular fibres only. Before attempting to study drugs acting on this organ, it must be remembered that if we stimulate the vagal branches, or the vagal periphery in the heart, we either diminish the force or the number of the cardiac impulses or both; and if we stimulate the accelerator nerves, we produce opposite effects. The actions produced by paralysing are the reverse of stimulating the respective nerves.

It is therefore safe to classify drugs according to their mode of action on the cardiac functions, rather than on its muscles and nerves.

1. *Cardiac tonics* are remedies which *increase the contractile force* of the heart with or without affecting the pulse-rate. The cardiac tonics which *slow the pulse-rate* are digitalis, strophanthus, squill, suprarenal extract, convallaria majalis, erythrophloeum, barium salts, caffeine, saponine, veratrine, &c. Of these, the first five are generally used. In large doses they usually arrest the heart in systole. The cardiac tonics which *do not alter the pulse-rate* are camphor, physostigmine, and minute quantities of alkaline, copper and zinc salts.

Therapeutics.—Digitalis and strophanthus are used to strengthen the heart's action enfeebled by acute febrile or inflammatory diseases, cardiac dilatation and mitral insufficiency. They are injurious in fatty degeneration of the heart and aortic insufficiency.

2. *Cardiac stimulants* are drugs which *increase both the force and number of the beats* of the heart. As brandy, whisky, rum, gin, chloroform, ether, sal volatile, strychnine, arsenious acid, musk, aromatic volatile oils, &c. Certain drugs, such as belladonna, stramonium,

hyoscyamus, cocaine, duboisine, saponine, sparteine, *only increase the cardiac beats.*

Therapeutics.—Many of the cardiac stimulants, such as anæsthetics, and alcoholic substances stimulate the heart reflexly through the nerve centres, as well as directly. They are employed to prevent a sudden failure of the heart's action from shock or syncope, due to injury, mental emotion, poisoning, febrile and other diseases. Indiscriminate use of antipyretics in fevers depresses the heart, but the timely use of alcohol, musk, and camphor may prevent their depressant effects.

3. *Cardiac depressants* are remedies which either *decrease the force* or the *number of the beats* of the heart, or both. Drugs which *diminish the contractile force and finally arrest the heart in diastole* are dilute acids, muscarine, apomorphine, pilocarpine; chloral, saponine, salicylic acid, alkaline salts, double copper salts, and double zinc salts in large doses. Drugs which *reduce both the force and the number of the beats* are aconite, hydrocyanic acid dilute, antimony salts, veratrine and ergot.

Therapeutics.—Aconite is chiefly used to reduce the volume and frequency of the pulse in inflammatory diseases. Salts of antimony are useful in acute inflammatory conditions of the air-passages and the lungs. Hydrocyanic acid dilute is an excellent remedy for the palpitation of the heart caused by dyspepsia.

B. Drugs that act on the cardio-inhibitory centre.—The action of drugs on the vagal centre can be better studied than that on the accelerator centre. If a drug, after administration to an animal, is observed to produce an alteration of the heart-beat, and that alteration is removed either by cutting the vagi, or by exciting the periphery of the nerve, if only one is divided, we conclude that the alteration of the heart-beat is caused by the drug acting on the vagal centre.

1. *Drugs which increase the activity of the cardio-inhibitory centre and slow the pulse-rate are :—*

Aconite	Chloroform	Nicotine	Veratrine
Æther	Convallaria	Squill	Digitals
Alcohol	Cocaine (in large doses)	Staphisagria	Pituitary Ext.
Atropine		Stramonium	Picrotoxin
Butyl-chloral	Hydrocyanic acid	Strophanthus	
Chloral	Hyoscyamine	Suprarenal extract	

2. *Drugs which diminish the activity of the cardio-inhibitory centre.*—Large doses of drugs mentioned in the foregoing list, as well as those which lower the blood-pressure, such as nitroglycerin, amyl nitrite, and cocaine, depress this centre.

C. Drugs that probably influence the accelerator centre.—Our knowledge of this class of remedies is very imperfect. Because

certain medicines still further increase the number of pulse-beats, after the vagi are cut, we suppose they act by stimulating the accelerator centre; as ammonia, caffeine, picrotoxin and delphinine. We know absolutely no drugs which can depress this centre.

D. Drugs acting on the cardiac nerve ganglia.—Drugs acting chiefly on the vagal ganglia are nicotine, conine, lobelia, gelsemium; the pulse after being first slowed secondly becomes irregular, rapid and weak.

CLASS V.—DRUGS THAT INFLUENCE THE BLOOD-VESSELS

The arteries are elastic, nervo-muscular tubes, whose calibre constantly changes owing to a variety of influences, which are transmitted by the *vaso-constrictor* and *vaso-dilator nerves*, from the vaso-motor centre located in the medulla, and certain other subsidiary vaso-motor centres in the spinal cord. By the blood-pressure, we mean the pressure to which the walls of the arteries are subjected. The rise and fall of the blood-pressure depend upon the activity of the vaso-constrictor and the vaso-dilator nerves respectively. Besides the afferent influences affecting the blood-pressure, there are other circumstances which greatly modify it. They are (1) the cardiac activity, (2) the total quantity of blood in circulation, and (3) the peripheral resistance.

We do not know how drugs act on the arterial system, whether by influencing the vaso-constrictor or the vaso-dilator nerves, probably both. But for practical purposes, they can be grouped under those that act *locally* on the blood-vessels, and those that act *through the nerve-centres*. When they act locally, it is impossible to state whether they act on the nerve-terminations or the muscular fibres.

A. Drugs that act locally on the blood-vessels.

1. *Immediate local vascular stimulants* are medicines which dilate arterioles when locally applied to them. They are:—

Alcohol	Chlorine	Horse-radish	Silver nitrate
Ammonia	Chrysarobin	Iodine	(strong)
Antim. tart.	Copper sulphate	Ipecacuanha	Warmth, as
Arsenious acid	(strong)	Mercuric nitrate	Fomentation,
Camphor	Cresote	Mineral acids	Poultice, &c.
Cantharides	Croton oil	(strong)	Volatile oils
Capicum	Chloroform	Mustard	Zinc chloride
Carbolic acid	Ether	Mylabris	(strong)
		Senega	

Alcohol, ether and chloroform can only act in the above manner, when their evaporation is stopped. Stimulant, irritant and antispasmodic inhalations (*see* page 132) also dilate the arterioles of the air-passages by their local action.

2. *Remote local vascular stimulants* are drugs which, when taken by the mouth, dilate arterioles by their remote local action on them. As amyl nitrite, nitroglycerin, sodium nitrite, spirit of nitrous ether, caffeine, erythrol tetranitrate, mannitol hexanitrate and nicotine.

Therapeutics.—The uses of local vaso-dilators will be discussed when we consider drugs that act on the capillaries. Remote local vaso-dilators are indicated in cases where we want to dilate a certain vascular area, to relieve a peripheral resistance to the circulation; as amyl nitrite in angina, spirit of nitrous ether and caffeine in dropsy and anasarca.

3. *Immediate local astringents, local hæmostatics or styptics* are drugs which contract vessels when locally applied to them. They can be grouped under the following heads according to their mode of action.

(a) *Drugs or measures that act by contracting the muscular fibres in the wall of the vessels.* As cold produced by any means, e.g. the evaporation of ether, ethyl chloride, methyl chloride and chloroform, ice, &c., alum, lead salts, silver salts diluted, sulphuric acid dilute; acetanilide, phenazone and hamamelis; iron, calcium, cadmium, strontium, nickel, cobalt and magnesium contracting slightly. Of these, cold, alum, lead salts, diluted silver nitrate, sulphuric acid, ferric chloride and ferrous sulphate are used therapeutically.

(b) *Drugs that act by coagulating the albuminous fluids in the tissues surrounding the vessels.* As alum, salts of silver, lead, bismuth, zinc and copper; persalts of iron, tannic acid and substances containing it, e.g. kino, catechu, krameria, hæmatoxylum, galls, hamamelis, &c.

4. *Remote local astringents or remote hæmostatics* are medicines which contract arterioles by acting locally on them, after introduction into the circulation. As ergot, caffeine (early effects), physostigmine and digitalis.

Therapeutics.—Styptics or local hæmostatics are used—

1. To stop external hæmorrhages.
2. To check excessive discharges, as leucorrhœa.
3. To constrict relaxed vessels, as in pharyngitis.

Remote astringents are useful in internal hæmorrhages, e.g. ergot in uterine bleeding.

B. Drugs that act on the vaso-motor centres.

1. *Drugs that dilate the vessels by acting on the vaso-motor centres.*—These are all remote vaso-dilators and are :—

Alcohol	Chloroform	Hydrocyanic acid	Lobelia	Tobacco
Aconite	Chloral	Hyoscyamus	Opium	Tartar emetic
Belladonna	Eth' r	Ipecacuanha	Stramonium	Veratrine

2. Drugs that contract the vessels by acting on the vaso-motor centres.—
These are :—

Ergot (very powerful)	Strophanthus Squill	Strychnine Hydrastis	Hamamelis Lead and ammonia salts (slightly)
Digitalis	Physostigmine	Cocaine	

Ergot, digitalis, physostigmine contract the arterioles also by their local action on them (*see* Remote Local Astringents). Many drugs, such as alcohol, ether, chloroform, stramonium, hyoseyamus, hydrocyanic acid dilute, and veratrine merely cause a transient contraction, followed by stimulation.

C. Drugs that act on the capillaries.—The capillary vessels are the connecting links between the arterioles and the minute veins, and through these the final distribution of the blood to the tissues is effected. Therefore the capillary circulation is immensely important to the pharmacologist, as alteration in the calibre of the capillaries causes a corresponding rise or fall of blood-pressure (*see* p. 141). We can influence limited areas of capillaries, particularly those of the skin, as shown below :—

1. *Drugs that cause a local dilatation of the capillaries and the arterioles of the skin.*—Under this head, we shall describe many useful remedies ordinarily known as *irritants*. They produce greater or less degree of vascular stimulation of the part to which they are applied. They can be grouped under the following classes, according to the degree of vascular excitement they produce :—

(a) *Rubefacients* are drugs which cause redness of the skin when applied to it. All immediate local vascular stimulants (*see* p. 141) act as rubefacients in the first instance.

(b) *Vesicants* or *Epispastics* cause vesicles or blisters to form when applied to the skin ; *e.g.* cantharides, mylabris.

(c) *Pustulants* are drugs which produce pustules when applied to the skin ; *e.g.* croton oil and tartar emetic ointment.

(d) *Caustics* or *Escharotics* are drugs which destroy the vitality of the part to which they are applied. They cause sloughing and inflammation of the surrounding area ; *e.g.* caustic potash or soda, zinc chloride, mineral acids, silver nitrate, &c.

When any of the above irritants is applied to the skin, with a view to lessen or counteract any morbid process which may be active in some other part of the body, it is called *counter-irritant*. Cantharides is commonly used for counter-irritation.

Therapeutics.—For direct topical action, immediate local irritants, such as iodine, carbolic acid, cantharides, &c., are applied to unhealthy sores and chronic sinuses to stimulate their healing. Escharotics are

used to destroy lupoid, cancerous and other growths. Counter-irritants are indicated as follows :—

(1) To subdue inflammation or to afford relief to the circulation of a part or organ in direct vascular connection with the skin, selected for the application of rubefacients or vesicants ; *e.g.* the application of a blister in acute pneumonia, pleurisy, hepatitis, &c.

(2) To help absorption of subjacent or subcutaneous morbid growths or effusion in a reflex way through the vaso-motor and trophic centres in the brain and cord ; *e.g.* the application of flying blisters in pleuritic effusion and synovitis, and of iodine in enlarged glands.

(3) To relieve pain arising from the passage of renal and biliary calculi, or from neuralgia, *e.g.* sciatica and facial neuralgia.

(4) To allay central nervous irritability, as in hysteria.

(5) To stimulate the central nervous system ; as in syncope, narcotic poisoning and in the lethargic condition of many acute idiopathic and inflammatory fevers.

(6) To relieve muscular irritability, *e.g.* sinapisms in choleraic cramps and lumbago.

(7) To remove any morbid process from the seat of disease to the irritated surface ; as the application of a mustard plaster to the great toe or foot when gout attacks important organs. When counter-irritants act in this manner, they are called *recusives* or *derivatives*.

2. *Drugs that contract the capillaries and the arterioles of the skin.*—All local vascular astringents do this (*see* p. 142).

CLASS VI.—DRUGS THAT ACT ON THE URINARY APPARATUS

A. Drugs that act on the kidneys.—The kidneys perform a two-fold function. They (1) regulate the amount of water in the system, and (2) remove the products of tissue-change, such as urea, uric acid, &c., which must remain in solution for excretion. The secretion of urine consists partly of filtration of water through the glomeruli, and partly of secretion by the cells of the tubuli uriniferi. The chief circumstances which modify the urinary secretion are (1) the arterial pressure and (2) the composition of the blood. By raising or lowering the renal or general blood-pressure, the secretion of urine can be increased or decreased as the case may be.

1. **Drugs that increase the amount of urine secreted** are called **diuretics**, and the effect thus produced is called **diuresis**. They act in various ways, as the following table taken from Brunton will show.—

Generally	{	Increased action of the heart	{ Digitalis Alcohol	Digitalis Erythro- phloeum Strophanthus Squill Convallaria Strychnine Caffeine Cold to sur- face
		Contraction of vessels in the intestine and throughout the body		
/ Raise arterial pressure		Contract effe- rent vessels or arteriæ rectæ so as to raise pressure in glomerulus and lessen ab- sorption in tubules or both	By action on vaso- motor centres	{ The same as above
Locally in kidney			By local action on vessels or nervous structures in the kidney itself	{ ? Broom ? Turpentine ? Juniper ? Copaiba Cantharides
		Dilate afferent vessels	{ Paralyse vaso-motor nerves or involun- tary muscular fibre, or stimulate vaso- dilating nerves	{ Nitrites Alcohol ? Urea
Act on the secret- ing nerves or secreting cells of the kidney itself	{	Increase creted	ex- { Urea Caffeine Calomel Liquor potassæ Potassium acetate, &c., and other saline diuretics	
		Increase creted	solids	

For practical purposes, diuretics may be grouped under the following heads :—

(a) *Stimulant diuretics*.—These act by stimulating the secreting cells of the kidney at the time of elimination. As gin, hock, cantharides, blatta orientalis, oleo-resins, resins and volatile oils, such as copaiba, cubebs, black pepper, turpentine, juniper, buchu, uva ursi, &c.

(b) *Refrigerant diuretics*.—These are little more than diluents, as plain or aerated waters, linseed tea, barley water, alkaline mineral waters, &c. Alkaline salts, especially those of potash, while passing through the urinary cells promote diuresis, they are therefore sometimes called *saline diuretics*.

(c) *Hydragogue diuretics* act by raising the blood-pressure in the glomeruli ; as digitalis, caffeine, squill, strophanthus, nitrous ether, adonis vernalis.

Therapeutics.—Diuretics are indicated to remove either **water** or **solids** from the body, and therefore we use them in :—

(1) Cardiac and pulmonary disorders, where the quantity of urine is diminished, or anasarca threatens.

(2) Renal diseases, to hasten the elimination of waste products or

poisonous materials circulating in the blood. Diseases in which there has been accumulation of fluid in natural cavities, as pleurisy and ascites.

(3) Those cases where there is a tendency for the deposition of solids and the formation of calculi.

2. Drugs that decrease the secretion of urine.—We do not know any safe remedies which can do this. Cantharides, turpentine and phosphorus produce congestion of the kidneys, and thus reduce the flow. Therapeutically they are never used for this purpose.

B. Drugs that directly influence the urine.

1. *Drugs that contribute towards the acidity of the urine.*—Benzoic acid and benzoates are the only reliable remedies which render the alkaline urine acid. They are converted into hippuric acid in their passage through the kidneys. Salicylic, citric and tartaric acids in large doses only feebly increase the acidity. Mineral acids have a negative effect, as they are excreted as neutral salts.

2. *Drugs that contribute towards the alkalinity of the urine.*—We have more powerful means at our disposal of rendering the urine alkaline. All potassium, sodium, lithium and calcium salts, except the salts of ammonium are powerful in this respect. Nitric acid slightly increases the amount of ammonia and thus makes the urine feebly alkaline.

3. *Urinary lithontriptics or antilithics* are remedies employed for dissolving any concretions or calculi formed in the urinary tract or for preventing the deposition of solids from the urine. Alkalis or piperazine should be given in uric acid and oxalate of lime calculi, and benzoates or benzoic acid in phosphatic ones. Potassium and lithium salts are valuable agents in converting uric acid into soluble urates as well as to alkalinize the blood and urine of gouty patients. Copious draughts of water or diluents also prevent deposition by washing away the solids.

4. *Drugs that prevent the decomposition of the urine.*—Decomposition takes place either from (a) retention of the urine, as in stricture of the urethra or in impacted stone, or from (b) inflammation of the pelvis of the kidney or bladder, thereby causing an admixture of purulent matter with the urine. Direct or remote antiseptics such as boric, salicylic and benzoic acids, uva ursi, cubebs, copaiba, sandal oil, urotropine and a few volatile oils render the urine aseptic.

5. *Drugs that alter the composition of the urine.*—They do this either by (a) their excretion in the original state in which they are administered, or by (b) the excretion of the products of their decomposition, or by (c) the admixture of morbid products such as blood, pus, &c., produced by the remedial agents. They are too numerous to be detailed, only a few typical ones are given below :—

Saline diuretics increase the solids of the urine.

Santonin makes acid urine greenish-yellow or yellow, and alkaline urine reddish. Carbolic acid, creosote, naphthalene, and other tar prepara-

tions render the urine dark greenish-brown. Picric acid gives it a bright yellow colour and methyl violet a dark blue. Rhubarb, senna, and chrysarobin render acid urine brownish, and alkaline urine purplish-red. Logwood makes alkaline urine violet.

All nitrites, acetanilide, potassium chlorate, pyrogallie acid, and occasionally large doses of arsenic and mineral acids render the urine dark red, from the admixture of the debris of the broken-up red corpuscles.

Cantharides, mylabris, turpentine, and salicylic acid in large doses render the urine bloody. Phosphorus in large doses causes urea, leucin, and tyrosin to appear. Turpentine imparts an odour of violets, while cubebæ and copaiba convey their characteristic smells.

Appearance of albumen in the urine is caused by cantharides, strychnine, and digitalis.

Many poisons produce glycosuria; phloridzin or phloretin being the chief.

Urine of persons poisoned with carbonic oxide remains sweet for some time. Lead taken for some time causes chronic interstitial nephritis.

C. Drugs that act on the bladder and the urethra.—By correcting abnormalities in the urine, *e.g.* extra-acidity by alkalisers, and decomposition by urinary antiseptics, we can indirectly soothe the irritation of the bladder, but **urinary sedatives** such as opium, hyoscyamus, belladonna, stramonium, pareira, buchu, uva ursi, couch grass, cissampelos, hygrophila, &c., act directly upon the irritated mucous membrane. Of these, opium and hyoscyamus are the most powerful.

CLASS VII.—DRUGS THAT ACT ON THE CUTANEOUS SYSTEM

The skin is the chief organ of perspiration and sensation. It also performs certain other specific functions, such as the regulation of heat (*see* Antipyretics), respiration, absorption, and the secretion of *sebum*. To the pharmacologist, perspiration is the most important.

A. Drugs that act on the sweat-glands.—These glands are abundant all over the skin, but most numerous where hairs are absent, as the palms of the hands and soles of the feet. The sweat, like the urine, is an excretion and is regulated by nerves called *secreting nerves*, whose centres are in the medulla and the cord.

1. Drugs that increase the secretion of the sweat, but not to such an extent as would not evaporate, are called **diaphoretics**. If the perspiration is increased so much as to run down in streams, they are called **sudorifics**. They may act as follows:—

(a) *By directly stimulating the sweat-centres.*—This may be accomplished by (1) measures which *increase the velocity of the blood* such as narcotics—opium, chloral, chloroform and alcohol, in later stage of their action; (2) measures which *increase the temperature of the blood*, such as hot drinks; and by (3) the following drugs:—

Dover's Powder	Ipecacuanha	Ammon. acetate	Nicotine ?
Camphor	Ammon. citrate	Antimony	

(b) *By stimulating the terminal ends of the nerves in the glands.*—Pilocarpine is most powerful in this respect. Dilatation of the cutaneous vessels by local warmth also aids diaphoresis. Nicotine and muscarine are said to act similarly.

(c) *By stimulating the secreting cells.*—It is difficult to say whether a drug acts on the gland-cells or on the periphery of nerves. Possibly ammonium acetate and citrate stimulate the cells and are eliminated along with the perspiration.

(d) *By dilating the cutaneous vessels.*—This is easily done by exciting vaso-motor nerves by means of local heat, such as hot fomentations, poultices, hot water or Turkish baths.

(e) *By increasing the blood-pressure by the ingestion of water or diluents.*

(f) *By reflexly stimulating the sweat-centres by afferent impulses.* e.g. the impulses caused by nauseating medicines, hot spiced food and hot drinks.

(g) *Diaphoretics whose mode of action is unknown,* are potassium acetate and citrate, arnica, aconite, colchicum, cubebs, salicin, serpentary, lobelia and senega.

It is to be noted, that many of the diaphoretics act in more than one way. Thus alcohol not only stimulates the sweat-centres, but dilates the cutaneous vessels and increases the flow of blood to the skin. There are others which excite the secretion, but at the same time diminish the cutaneous circulation. Diaphoretics have therefore been sometimes divided into *stimulant* and *sedative diaphoretics*. Antimony, ipecacuanha, and pilocarpine are grouped as sedative diaphoretics, and the rest as stimulant ones.

Therapeutics.—Diaphoretics are indicated :—

(a) To reduce pyrexia.

(b) To cut short a threatening catarrh, or inflammation caused by specific poisons or metabolic products.

(c) To lessen the accumulation of fluid in the system, as in dropsy, and to relieve excretory organs, e.g. kidneys in albuminuria and intestines in diarrhoea.

(d) To eliminate excrementitious products through the skin when the action of the kidneys is suspended, as in uræmia. Pilocarpine is most useful for this purpose.

(e) To promote cutaneous circulation in many chronic skin diseases, e.g. warm water or Turkish baths in psoriasis.

2. Drugs that diminish the secretion of sweat are anhydrotics or antihydrotics. They may act :—

(a) *By depressing the excitability, or removing the cause, of excitation from the sweat-centres.*—Measures which reduce the venous condition of the blood, indirectly help the reduction of perspiration. Thus cold sweats of exhausting diseases can be checked by ammonia, alcohol, strychnine, iron, fresh air and good nourishing food.

DRUGS DIMINISHING THE SECRETION OF SWEAT 149

(b) *By depressing the activity of the efferent or secreting nerves.*—Opium in certain combinations with ipecacuanha as Dover's powder, or with sulphuric acid checks the night sweats of phthisis.

(c) *By depressing the activity of the terminal ends of the secreting nerves.*—The effect of atropine, extract of belladonna, stramonium and hyoscyamine is very powerful in this respect. Measures which constrict cutaneous blood-vessels, such as the application of cold, sponging with lotions containing sulphuric acid and tannic acid also check sweating.

(d) *By lessening the activity of the afferent nerves.*—Local cold applications, cool atmosphere, fanning, &c., do this.

(e) *Anhydrotics whose mode of action is unknown.*—These are acids, quinine, nux vomica, picrotoxin, zinc oxide, salicylic acid and muscarine.

Therapeutics.—Anhydrotics may be used to check either excessive general sweating, as the night sweats of phthisis, or the cold sweats of general debility, or local sweating as in hyperidrosis or bromidrosis of the hands or feet.

3. Drugs that alter the composition of sweat.—Certain drugs when taken internally are eliminated by the sweat. They are iodine, potassium iodide, tartaric acid, benzoic acid in the form of hippuric acid and succinic acid.

B. Drugs which soften and relax the parts to which they are applied, are called **emollients** or **protectives**.—By relaxing contractile tissues and dilating blood-vessels they relieve tension and pressure upon the nerves. They prevent cracking of the skin by supplying it with fat or moisture. As bland oily and fatty substances, glycerin, vaseline, lanoline, hot poultices, warm water, &c.

C. Drugs which protect mucous membranes from irritation are called demulcents.—They are glycerin, linseed, white of egg, ispaghul, gelatin, isinglass, honey, starch, &c.

D. Drugs that act on the capillaries and arterioles of the skin.—*See* pages 143-4.

E. Drugs that cause eruptions to appear on the skin.—They produce them possibly by irritating the skin during their elimination. A list of drugs and eruptions taken from "Quain's Dictionary of Medicine," is given below:—

Diffuse or patchy erythema.—Antimony, arsenic, belladonna, benzoate of sodium, boric acid, bromides, chloralamide, chloral hydrate, chrysarobin, copaiba, salicylic acid, stramonium, tar.

Scarlatiniform erythema.—Belladonna, chloral hydrate, copaiba, iodoform, quinine, strychnine, bromide of nickel.

Papular or morbilliform erythema.—Antipyrine, arsenic, bromides, chloral hydrate, cubebs, morphine, quinine, terebene, turpentine.

Nodosum-like erythema.—Bromides and iodides.

Urticaria.—Antipyrine, arsenic, bromides, copaiba, iodides, morphine, quinine, resin, salicylic acid, salol, santalin.

Vesicles.—Cannabis Indica, chloral hydrate, cod-liver oil, copaiba, iodides, morphine, salicylic acid, quinine, turpentine.

Bullæ.—Bromides, cannabis Indica, chloral hydrate, copaiba, iodides, morphine, phosphoric acid, quinine.

Pustules.—Arsenic, bromides (confluent), chloral hydrate, iodides (isolated), salicylic acid, antimony.

Purpura.—Chloral hydrate, chloroform inhalation, iodides, quinine salicylic acid.

Pityriasis rubra (?).—Bichromate of potassium.

Psoriasis (?).—Borax, bichromate of potassium.

Eczema.—Bicarbonate of potassium, bromides, chrysarobin, iodoform.

Gangrene.—Arsenic, ergot, iodides, quinine.

Persistent desquamation.—Quinine.

Furuncles.—Arsenic, bromides, quinine.

Keratosis palmaris.—Arsenic.

Pigmentation.—Arsenic, nitrate of silver, picric acid.

Herpes zoster.—Arsenic.

F. Drugs that influence the sensory apparatus of the skin.—

These are the same drugs that act on the sensory nerve terminations. (See p. 155.)

G. Drugs that affect the hair.—The hairs are epidermal growths contained in pits or *hair-follicles*. Their growth is dependent upon the nutritive supply and the nerve-power of the skin.

1. *Drugs that promote the growth of the hair.*—Measures which improve the nutrition of the hair-follicles by augmenting their blood-supply, especially immediate local vascular stimulants, promote growth of hair. They are liniments of ammonia, camphor, ammoniated camphor, turpentine, &c.; lotions (hair-washes) containing tincture of cantharides, spirit of rosemary, tincture of capsicum, ammonia, pilocarpine, &c.; iodine; mercurial ointments and oils of cade and winter-green.

Therapeutics.—For baldness due to defective nutrition, *e.g.* after acute febrile attacks, stimulating hair-washes as mentioned above are useful. In obstinate cases, repeated blistering or the strong acid solution of pernitrate of mercury lightly brushed over is necessary. For syphilitic alopecia, mercurial ointments should be applied and constitutional treatment adopted.

2. *Depilatories.*—See page 68.

CLASS VIII.—DRUGS THAT INFLUENCE METABOLISM

Metabolism is the sum total of chemical exchanges which occur in the tissues through the medium of the blood. The protoplasm of the tissues incorporates oxygen and other metabolic materials

from the plasma and gives off carbonic acid, urea, water and other products of oxidation by the lungs, kidneys, skin and bowels. During this intake and output by the tissues, the protoplasm undergoes alterations or changes. In short, the tissues and the plasma are constantly acting and reacting upon each other, the *former altering the plasma and the latter the tissues*.

The metabolic process may be affected by various influences, such as :—

- (1) Variations in the composition and the supply of blood.
- (2) Variations in the supply of oxygen.
- (3) Variations in the muscular activity.
- (4) Variations in the activity of excretory organs.
- (5) Variations of surrounding temperature, as of climate and baths.
- (6) Variations in the activity of trophic centres.
- (7) Medicinal agents.

A. Drugs that increase the metabolic activity are [called **metabolic stimulants** or **tonics**. They may be either **local** or **general**.

1. *Local metabolic stimulants* are drugs which stimulate the nutritive process of a local area, e.g. the growth of hairs over a bald surface, or the removal of stiffness, swelling, and atrophy of muscles in chronic rheumatism. They act :—

- (1) By increasing the vascularity of the part and thus carrying more nutritive materials to the tissues.
- (2) By removing more rapidly the products of nutrition.
- (3) By increasing the protoplasmic activity of the tissues. All immediate local vascular stimulants (*see list, page 141*) act as local metabolic stimulants.

Local metabolic stimulants are called *resolvents* when they cause absorption of inflammatory or other swellings.

2. *General metabolic stimulants* or *general tonics* are drugs which cause an increase in the strength and weight of the body, by stimulating the functional activity of the digestive organs, as well as by improving the condition of blood. Therefore, by *tonics*, we mean remedies or measures which contribute towards the improvement of the tone of the body or any of its parts. If they promote appetite and digestion, they are called *gastric tonics*; if they enrich hæmoglobin and increase the number of red corpuscles, they are called *hæmatinic tonics* or *blood tonics*; if the imperfectly performed nervous functions are restored to a normal condition, they are called *nervine tonics*, and so on. Medicines during the metabolic process become loosely incorporated with the cells, and form certain oxidation products which are

thrown off; and in thus passing through an organ, they *modify the force which it displays*. The general tonics are:—

Iron	Calcium chloride	Caffeine	Thyroid
Mercury	„ Hypophosph.	Guaiacum	Water
Arsenic	Sod. Hypophosph.	Sarsa	
Phosphorus	Sulphurated lime	Hemidesmus	
Antimony	Coca	Mezereum	

B. Drugs that diminish the metabolic activity are called **metabolic depressants**.—They act either by being themselves so readily oxidised that they rob the protoplasm of oxygen, or by making the oxyhæmoglobin a more stable compound, so that it cannot easily part with its oxygen. They are alcohol, quinine, phenazone, acetanilide, salicin, glycerin, resorcin, &c.

C. Alteratives are drugs which cure disease without producing any perceptible change in any of the organs. They appear to *alter morbid processes*, but in the present state of our knowledge we cannot demonstrate how they act, perhaps by improving the metabolic process through their influence on trophic centres. The most important of this group are mercury, iodine, arsenic, gold, colchicum, &c.

CLASS IX.—DRUGS THAT ACT ON THE BODY-HEAT

Drugs, except when given in toxic doses, have very little effect upon the temperature in health, but they act powerfully when it has been either depressed or raised above the normal. The maintenance of the body heat at about 98.4° F. is the result of a nice adjustment between heat production on the one hand and heat dissipation on the other, and anything which disturbs this equilibrium will cause either a rise or fall of temperature as the case may be.

A. Antipyretics or Febrifuges (*febris*, fever and *fugo*, to drive away) are remedies which lower the temperature of the body in pyrexia. They act in the following ways:—

1. *By diminishing the production of heat by affecting metabolism through the nerve-centres*.—As phenacetin, phenazone, acetanilide, quinine, salicin, salicylic acid. Of these, the first three probably act on the corpus striatum. How the remaining act is not known, probably they lessen heat production by depressing the blood-pressure and metabolism.

2. *By dilating the cutaneous blood-vessels and thus augmenting radiation*.—As alcohol, antimony, aconite, opium, warm baths.

3. *By increasing the amount of perspiration* (see Diaphoretics) and thus causing a loss of heat by evaporation.

4. *By abstracting heat*.—Cold water, cold sherbets and ice may be swallowed for this purpose. Cold or tepid water bath, cold wet-pack, cold sponging, local irrigation with cold water, cold water compress,

injection of cold water into the rectum and vagina, and evaporating lotions are agents, by which we can abstract heat from a local surface as well as that of the body.

5. *By neutralizing or destroying any specific poison causing pyrexia.*—As quinine and arsenic in ague, and antidiphtheritic serum in diphtheria.

Therapeutics.—Antipyretics are used to reduce febrile temperature. Venesection, antimony, aconite, opium, &c., are now discarded. Phenazone, acetanilide, and sodium salicylate are not so much used now, because they produce at times dangerous symptoms. Phenacetin is far safer than any of the above, but is less powerful. Quinine and salicylic acid are useful antipyretics in malarial fevers and rheumatism respectively. Cold baths, cold sponging, application of ice or evaporating lotions are the safest procedures, and can be freely used. In fact the general rule should be always to endeavour to reduce pyrexia either by actual abstraction of heat or by promoting heat dissipation; and never to use drugs which lessen the production of heat except in cases of sudden emergency.

B. Calorificrescents are remedies which elevate the body-heat. They may be **local**, as fomentations, poultices, rubefacients (see p. 143) or **general**, as belladonna, caffeine, cocaine and picrotoxin in toxic doses. Certain animal poisons as that of shell-fish, tuberculin and albumoses also cause a rise of temperature. β -tetrahydro-naphthylamine may increase the temperature many degrees. How these remedies act is not known. Therapeutically they are never used.

CLASS X.—DRUGS THAT ACT ON THE MUSCULAR SYSTEM

Elaborate experiments were made to determine the action of drugs on the muscles. Our scope does not permit us to go over them, we therefore give a summary of results as classified by Brunton, based on the classification of Kobert.

Group I.—“*Leaves the irritability of the muscle unaffected, but diminishes the total amount of work it is able to do.*” As apomorphine, asclepiadine, delphine, saponine, copper, zinc, and cadmium. Antimony, arsenic, iron, and platinum in large doses.

Group II.—“*Diminish the excitability of the muscle as well as its capacity for work.*” As potassium, lithium, ammonium, quinine, chloroform, chloral, and alcohol.

Group III.—“*Diminish the capacity for work, and produce marked irregularity in its excitability.*” As lead, emetine, and cocaine.

Group IV.—“*Alter the form of the muscular curve.*” As veratrine, salts of barium, strontium and calcium, digitalis, squill and oleander.

Group V.—“*Increase the excitability.*” As physostigmine.

Group VI.—“*Increase the capacity for work.*” As theobromine and caffeine.

CLASS XI.—DRUGS THAT ACT ON THE NERVOUS SYSTEM

By the nervous system, we mean the brain, the bulb, the cord, the nerves both sensory and motor and the various ganglia. The highest motor and sensory centres as well as those of volition, intellect, emotion, &c., are contained in the cerebral convolutions, while the simple automatic and reflex centres are in the basal ganglia, cerebellum, medulla and cord. All nerve-centres are connected with one another by nerve-filaments called *collaterals*, for co-ordination of impulses, and constitute the **central nervous system**. The ganghonic system, though associated with the central nervous system, is chiefly automatic in its action, and is known as the **sympathetic system**. The cerebral or highest centres are not only excitable or capable of being brought into action by afferent impulses, but possess an inherent power of spontaneously originating impulses themselves. Their action is therefore both **reflective and spontaneous**. To the pharmacologist this **reflective or reflex action** is very important. It is effected by (1) an afferent sensory nerve, (2) reflex centre, and (3) an efferent, motor or secretory nerve. An afferent impression excited by an irritant on the skin or other structures of the body, is conducted by an afferent nerve to a system of nerve-cells known as the *reflex centre*, where it produces a certain protoplasmic disturbance, resulting in a force, which either remains there as potential energy, or is conveyed by a different tract—efferent nerve—to perform some specific action either in the muscles, viscera or the blood-vessels. Medicines can affect only some of the functions of the nervous system as shown below :—

A. Drugs that act on the periphery of the sensory nerves.—

These refer only to common sensory nerves and not those of the special senses. The action of a drug on the tactile sensibility is ascertained by observing, whether it produces after application a diminution of pain if present, or a loss of sensibility, or an increase of sensibility or pain.

1. Drugs that depress the periphery of the sensory nerves.—

These may be either **local anodynes** or **local analgesics**, or **local anæsthetics**.

(a) *Local anodynes*.—These can act only when pain is present. They relieve pain by either directly paralysing the terminal ends, or by depressing the nerve-centre as well as the periphery. They are :—

Aconite	Menthol	Ether	Aromatic oils
Belladonna	Acid. hydrocyan.	Chloroform	Zinc oxide
Veratrine	dilute	Opium	Sodium bicarb.
Carbolic acid	Creosote	Stramonium	Chlorotone
Chloral	Alcohol	Hyoscyamus	

Therapeutics.—In most of the neuralgias, aconite, belladonna, chloral c. camphor, menthol, spray of ether and alcohol, application of aromatic volatile oils are of special service. Morphine hypodermically or endermically removes superficial and deeper pains. Pruritus is relieved by lotions containing carbolic acid, diluted hydrocyanic acid and sodium bicarbonate.

(b) *Local anæsthetics.*—These lessen the tactile sensibility of a surface to which they are applied. In fact they are also *local anodynes*. They are carbolic acid, eucaine, kava, cocaine injected hypodermically; ether, ethyl chloride, methyl chloride when sprayed, and extreme cold.

2. *Drugs that stimulate the periphery of the sensory nerves.*—When the blood-supply of a part is increased by immediate local vascular stimulants (see p. 141), the terminal ends of sensory nerves become irritated, giving rise to tenderness and pain (peripheral neuritis).

Therapeutics.—By stimulating the periphery of the sensory nerves by sinapisms, electricity, extreme heat or cold or local vascular irritants, we can reflexly stimulate the heart and lungs, and can rouse patients from unconsciousness, as that of syncope, opium poisoning, &c. (see Counter-Irritants, p. 143).

B. Drugs that act on the periphery of the motor nerves.—The action of this group of drugs is best exemplified by *urara*, a South American arrow-poison which directly paralyses the motor end-plates.

1. *Drugs that paralyse the periphery of the motor nerves in muscles.*—They are *local motor paralyzers* and are :—

Alstonia	Hydrocyanic acid dil.	Methyl codeine	Sparteine
Amyl nitrite	Hyoscyamus	„ meotine	Stramonium
Atropine	Lobeline	„ quinine	Galvanism
Camphor	Methyl brucine	„ strychnine	
Cocaine	„ cinchonine	Nicotine	
Conium	„ morphine	Saponine	

Therapeutics.—Of these, belladonna, conium and cocaine are used therapeutically to paralyse, or at least to overcome the spasmodic contraction of, the sphincter ani in rectal fissures and ulcers. They also depress the sensory terminal ends.

2. *Drugs that stimulate the periphery of the motor nerves in muscles.*—They are *local motor stimulants* and are :—

Aconite	Nicotine	Strychnine	Electricity
Pilocarpine	Pyridine	(slightly)	(faradic)

C. Drugs that act on the nerve-trunks.—The trunks of nerves are less affected than the periphery.

1. *Drugs that affect the motor terminal ends and twigs.*—Lead, mercury, arsenic and alcohol, when continued for a long period, produce inflammation, fatty degeneration and other changes in the terminal ends and twigs of the sensory and motor fibres, especially those of the

latter, causing tingling and pain, and later on paralysis of motion, and to some extent that of sensation.

2. *Drugs that affect the sensory nerve-trunks.*—Opium is most powerful in this respect. It can arrest the conduction of afferent impulses either at the periphery, the trunk or the sensorium (see p. 159).

D. Drugs that influence the spinal cord.—The cord performs three specific functions, *viz.*—(1) the conduction of (a) sensory or afferent, and (b) of motor or efferent impressions, (2) the reflex action, and (3) the origination of impulses by special nerve-centres, as the sweat-centres, located in the cord. We do not know much of drugs acting on these normal processes, except what is given below:—

1. **Spinal stimulants.**—These drugs increase the irritability of the anterior cornua and produce convulsions. They are:—

Strychnine	Thebaine	Chloroform	Ergot
Brucine	Ammonia	Ether	Opium

Of these, strychnine is the most powerful, which in small and moderate doses intensifies the reflex excitability, and in large doses produces tetanus. Opium first stimulates and then depresses.

Therapeutics.—Strychnine is largely employed in motor paralysis local or general, after the inflammatory stage is passed.

2. **Spinal depressants.**—These depress or paralyse the activity of the anterior cornua. They may be either direct or indirect paralyzers.

(a) *Drugs which directly depress the reflex movements are:—*

Chloral hydrate *	Apomorphine *	Amyl nitrite	Lithium
Bromides	Veratrine *	Sodium nitrite	Silver
Physostigmine	Emetine	Camphor *	Arsenic *
Chloroform *	Alcohol *	Mercury	Carbolic acid *
Opium *	Ergot	Antimony	Zinc
Ether *	Gelsemium	Sodium	Turpentine
Cannabis Ind.*	Saponine	Potassium	Colchicum

Kava root

Those with * first excite slightly and then depress.

Therapeutics.—Chloral hydrate, bromides, physostigmine, calabar bean, opium, cannabis Indica, and chloroform or ether inhalation are ordinarily used to check convulsions, as in tetanus.

(b) *Drugs which indirectly depress the reflex movements.*—These act by arresting the circulation of the spinal cord. Aconitine, digitalin and large doses of quinine are powerful in this respect.

E. Drugs which act on the cerebrum.—The structure of the brain being even more complicated than that of the cord, our knowledge of the pharmacology of this organ is necessarily still more obscure

Although we can influence the functions of the brain more rapidly, yet we cannot localize the action of drugs. However, they are found to obey *two general laws* while acting on the brain, *viz.* :—

a. *The law of dissolution.*—This was first described by Jackson, and consists in the progressive action of a drug on the nerve-centres in the inverse order of their development in animal life, *i.e.*, those that are the highest and developed last are affected first, and then the next to highest, and so on, until the lowest ones are affected. Thus, alcohol paralyses first the highest centres, as of will, intellect, &c., then those of the muscles as is evidenced by staggering gait, and lastly those of the heart and respiration (*see Alcohol*).

β. *The law of primary stimulation and subsequent depression.*—This is well illustrated by the action of a drug which in small doses stimulates certain functions, and in large doses depresses them. Thus, chloroform in the first stage of its action stimulates the motor cells, producing tetanic movements; but in the later stage depresses them and causes a relaxation of the muscles.

1. Drugs that affect the functions of the cerebrum or brain.

(a) **Cerebral stimulants.**—These excite the functional activity of the brain. If the excitement becomes disorderly so as to lead to incoherence and delirium, they are called *deliriant*s. If they produce mirthful and comfortable feelings, they are then known as *exhilarant*s. They are :—

Alcohol	Stramonium	Tobacco	Quinine
Chloroform	Hyoscyamus	Tea	Salicylic acid
Ether	Cannabis Ind.	Coffee	Santonin
Nitrous oxide	Opium	Coca	Lupulus
Belladonna	Camphor	Guarana	

(Of these, belladonna, hyoscyamus, stramonium, cannabis Indica are **deliriant**s.)

Therapeutics.—Many of these depress after primary stimulation. Some of the above are habitually consumed, *e.g.* tea, coffee, coca, tobacco, opium, ganja, and alcohol. Alcohol and opium are very powerful cerebral excitants. In cases of fainting, shock due to accidents to the head, drowning, &c., alcohol, ether, chloroform, and cardiac stimulants become necessary.

(b) **Cerebral depressants.**—These drugs lessen the functional activity of the brain, and can be classified into (1) *hypnotics*, (2) *narcotics*, (3) *general anodynes*, and (4) *general anæsthetics*.

(1) *Hypnotics or soporifics* are remedies which induce sleep. During normal sleep, both arteries and veins remain contracted, and the brain becomes anæmic. Therefore, to produce sleep, we must (a) lessen its activity, and (b) reduce its circulation. We can do this by *direct* and *indirect measures*.

a. *The direct hypnotics act by reducing the cerebral metabolic processes either by directly acting on the nerve-cells or affecting them through the circulation. They are:—*

Chloral hydrate	Hops	Chloralose	Ural
Sulphonal	Paraldehyde	Trional	Urethane
Bromides	Chloralamide	Tetronal	Chloretone
Narcotics (q.v.)	Cannabis Ind.	Hedonal	
Hyoscyanine	General anas-	Somnal	
Hyosine	thetics (q.v.)	Veronal	

β. *The indirect hypnotics act by drawing the blood away from the brain elsewhere, by increasing the activity of circulation. Thus by the application of a warm poultice to the abdomen, by warm foot-baths, warm drinks, and warm wet-pack, we can indirectly induce sleep. Digitalis is an excellent indirect hypnotic. It acts by increasing the contractile power of the arteries leading to the brain, and thus prevents cerebral vascularity, which so often occurs merely from recumbent position in enfeebled and atonic conditions of the body.*

Therapeutics.—The cause of insomnia must, if possible, be removed. Sleep is better induced by combining the direct with the indirect hypnotics. Chloral hydrate, sulphonal and bromides produce almost natural sleep. Morphine or opium is an excellent hypnotic, if the sleeplessness is due to pain. Toleration is often induced by these drugs. Bromides are indicated when the insomnia is due to overwork, mental worry and anxiety.

(2) *Narcotics*, as Brunton defines, are “substances which lessen our relationship with the external world.” Hence, they include (a) the *direct hypnotics*, (b) the *general anodynes* and (c) the *general anæsthetics*. Narcotics induce sleep and relieve pain in moderate doses, but are powerful respiratory and vascular depressants in large doses. The following act as narcotics when given in large doses:—

Opium	Stramonium	Chloral Hydrate
Belladonna	Cannabis Ind.	General anæsthetics
Hyoscyamus	Alcohol	Hops

(3) *General anodynes or analgesics.*—These relieve pain by depressing the excitability of nerves or nerve-centres. They act by arresting the conduction of afferent impressions either at the seat of origin in the course of transmission, or at the point where they affect the sensorium. They are:—

Opium	Hyoscyamus	General anæsthetics
Morphine	Stramonium	(in small doses)
Belladonna	Cannabis Ind.	Phenazone
Atropine	Hyoscyamine	Phenacetin
Butyl-chloral	Gelsemium	Acetanilide
Conium	Chloral	

Of these the action of opium is most marked. It relieves pain by arresting the afferent impressions at all the points mentioned above. Belladonna does this by depressing the excitability of the sensory nerves, and chloral hydrate, butyl chloral, gelsemium, &c., by lessening the excitability of the cerebral centres.

Therapeutics.—Direct general anodynes are indicated in cases where pain is so intense as to produce loss of sleep, and to cause disturbance of the whole system. Opium or morphine in a variety of forms can be administered by various routes (*see* pp. 102-4); the hypodermic method being the quickest and the most powerful. Belladonna in large doses is very useful in urinary colic. If we desire to have the anodyne effect produced more completely and quickly, we must use general anaesthetics, as in parturition, severe biliary and urinary colic. Phenazone, gelsemium, butyl chloral, &c., relieve neuralgias.

(4) *General anaesthetics.*—These drugs abolish consciousness and voluntary action so that no pain is felt. General anaesthesia can be induced by **indirect** and **direct** measures. Indirectly it can be done by (1) arresting the cerebral circulation and thereby stopping the metabolism of the nerve-cells, either by compression or ligature of the carotids, or by combined pressure over the carotids and vagi; (2) by diminishing the oxidation of the nerve-cells by increasing the venosity of the blood, as in poisoning by charcoal gas; and (3) by draining the blood from the head to other parts of the body, as by suddenly lifting a patient to a standing posture after he has been laid flat on the ground. Directly, by the inhalation of chloroform, ether, nitrous oxide and several derivatives of ether and alcohol. These remedies, while acting as direct general anaesthetics, very well illustrate the *two general laws of cerebral pharmacology* already mentioned in page 157.

Therapeutics.—The direct general anaesthetics are given:—

- (1) To produce insensibility to pain, as in biliary and renal colic.
- (2) To remove consciousness, as in surgical operations.
- (3) To relax or remove muscular spasm or activity, as in tetanus, hydrophobia, poisoning by strychnine, and in the reduction of hernia, dislocations and fractures.
- (4) To diagnose certain obscure disease, such as phantom tumours caused by the contraction of the abdominal muscles.

(c) **Drugs that act on the motor centres of the brain.**—The investigation of the pharmacology of drugs on the motor area of the brain is not difficult. The motor centres being situated on the two sides of the fissure of Rolando, the cortical substance of the motor area is exposed by trephining, and stimulated by faradic current, before and after the administration of a drug, and the strength of the current necessary to produce a similar movement before and after drugging is noted. Another experiment is to expose the cortex on one side and to estimate the strength of current necessary to produce a convulsion.

and then to close the wound and allow it to heal. The animal is then drugged for several weeks, and the corresponding area on the opposite side is exposed, and the strength of current to produce a similar convulsion is noted. From these experiments we have been able to deduce the following results :—

(1) *Drugs that depress the excitability of the motor centres* are chiefly the bromides. Alcohol, ether and chloroform have a similar effect. Chloral hydrate reduces the excitability temporarily.

Therapeutics.—Bromides and chloral hydrate, especially the former, are employed in convulsive disorders, such as epilepsy, hysteria, puerperal eclampsia, infantile convulsions, &c.

(2) *Drugs that increase the excitability of the motor centres.*—It is very difficult to say whether these drugs act directly on the motor nerve-cells, or influence them by increasing the viscosity of the blood, through their action on the respiratory and circulatory centres. Of this group, strychnine, atropine, physostigmine and absinth are the most powerful.

F. Drugs that influence the cerebellum.—We know very little of the functions of the cerebellum, except that it controls all co-ordinated movements. Alcohol in large doses causes staggering gait, thickness of speech, and irregular movements of the hands, thereby illustrating its action on the cerebellum. Apomorphine in toxic doses does not produce vomiting in animals, but makes them go round and round.

G. Drugs acting on the sympathetic system.—Certain drugs such as nicotine, conine, lobelia and curara in large doses internally, or even in small doses if applied locally, have been shown to paralyse the sympathetic ganglia. Sphacelnic acid under similar circumstances stimulates these ganglia. Further researches are wanted.

CLASS XII.—DRUGS THAT ACT ON THE EYE

A. Drugs that act on the conjunctiva.—These may be divided into the following groups, according to their local action on this membrane :—

Astringents	Sedatives	Antiseptics	Irritants
Alum	Cocaine	Boric acid	Iodine
Lead acetate	Atropine	Boro-glyceride	Calomel
Zinc sulphate	Opium	Corrosive sublimate	Yellow mercuric oxide
.. chloride	Belladonna	Carbolic acid	Silver nitrate
Corrosive sublimate	Eserine	Potassium permanganate	Copper sulphate
Tannin	Anæsthetics	Quinine	Jequirity seeds
Silver nitrate	Cocaine		

Therapeutics.—Cocaine is chiefly used in ophthalmic practice to lessen pain and produce local anæsthesia. Boric acid is used as an antiseptic wash in conjunctivitis. Astringent collyrium containing

zinc sulphate, alum, silver nitrate, tannic acid, &c., reduces the inflammation, but alum and lead acetate are objectionable, as the former may dissolve the corneal cement, and the latter may be deposited as an insoluble albuminate if there is a corneal ulcer. Calomel is an effective stimulant and absorbent in pustular conjunctivitis. Iodine removes recent opacities of the cornea. Yellow mercuric oxide ointment (diluted) and copper sulphate are good applications for granular lids. Tannin removes pannus.

B. Drugs that act on the lachrymal glands.--Local irritants and pilocarpine increase the flow of tears. Prolonged use of atropine does the contrary.

C. Drugs that act on the pupil.--The iris is the regulator of the pupil. It is composed of two sets of muscular fibres, the circular which contract, and the radiating which dilate the pupil. The sphincter iridis (circular fibres) is innervated by the third nerve, and the centre for the contraction of the pupil is located in the corpora quadrigemina. Stimulation of the third nerve contracts, and its section dilates the pupil. The cervical sympathetic is the nerve of the radiating fibres. Its stimulation causes dilatation, and its division contraction of the pupil. The cilio-spinal centre controls dilatation.

1. Drugs that act on iris.

(a) **Drugs that dilate the pupil** are called **mydriatics** or **pupil-dilators**. They act:--

(1) *By paralyzing the terminal ends of the third nerve.*--As atropine, homatropine, euphthalmine, daturine, hyoscyamine, conine, gelsamine, aconite, amyl nitrite, muscarine and hydrocyanic acid. The action of the last five is rather doubtful.

(2) *By stimulating the terminal ends of the cervical sympathetic.*--As cocaine.

(3) *By stimulating the sympathetic centre.* As anæsthetics in the later stage of their action.

Many of them, such as atropine, daturine, hyoscyamine, act locally as well as when given by the mouth.

(b) **Drugs that contract the pupil** are called **myotics** or **pupil-contractors**. They act:--

(1) *By stimulating the terminal ends of the third nerve.*--As pilocarpine and meotine (?).

(2) *By stimulating the sphincter iris.*--As physostigmine.

(3) *By stimulating the centre for contraction.*--As opium and general anæsthetics in the early stage of their action.

Some of the myotics, such as physostigmine, contract the pupil if locally applied, and when introduced into the circulation.

Therapeutics.--The mydriatics are used:--

(1) To break down or prevent adhesions of the iris as in cataracts.

(2) To prevent prolapse of the iris, or to restore it to its normal position if already prolapsed in corneal perforation.

(3) To dilate the pupil for ophthalmoscopic examination.

The myotics (especially eserine) are used :—

(1) To counteract the effects of mydriatics.

(2) To prevent much light entering the pupil.

(3) To lessen intra-ocular tension in glaucoma.

D. Drugs that act on the ciliary muscle.—This muscle adjusts the lens for distant and near objects of vision. During rest, the lens remains flattened, but to see nearer objects it becomes more convex owing to the drawing in of the ciliary processes by the contraction of the circular fibres. It is supplied by the third nerve.

1. Drugs that impair the accommodation of the lens.—Drugs which affect the iris, influence also the accommodation. Both mydriatics and myotics do this.

2. Drugs that affect the intra-ocular tension. They are of two kinds :—

(a) *Drugs that increase the tension* are atropine, hyoscyamine, and daturine in large doses.

(b) *Drugs that diminish the tension* are cocaine, physostigmine and hyoscine.

E. Drugs that affect the sensory apparatus of the eye.—Strychnine increases the sensitiveness to impressions and capacity for seeing blue. Santonin affects the sense of colour, objects appearing first violet and then yellow.

F. Drugs that produce subjective sensation of sight.—*Cannabis Indica* produces pleasant and laughable visions in some persons. Alcohol in toxic doses induces visions of a disagreeable nature (delirium tremens). Sodium salicylate does the same. Quinine, tobacco and lead cause a failure of sight for form and certain colours.

G. Drugs that act on the ocular muscles.—Gelsemium causes paralysis of the ocular muscles, particularly the levator palpebrae and rectus externus. Conine causes ptosis, and cocaine protrusion of the eyeball.

CLASS XIII.—DRUGS THAT ACT ON THE EAR

A. Drugs that act on the aural mucous membrane.—These may be classified into **local anodynes** or **local sedatives**, **local astringents**, **local antiseptics** and **emollients**. To relieve pain due to catarrhal inflammation of the mucous membrane, we use opium, morphine, belladonna, atropine, chloral c. camphor, warm boric acid lotion, cocaine (alkaloid) dissolved in warm oil, &c. In otorrhoea, lotions containing boric acid, potassium permanganate, zinc sulphate should be injected, and insufflations of powdered boric acid and iodoform separately or mixed together, may be used. Glycerin acid

tannic sometimes does more good than many antiseptic injections. For dryness of the membrane, glycerin and bland oils are serviceable.

B. Drugs that act on the cerumen.—An accumulation of wax sometimes gives much trouble. Syringing the ear with plain warm water, or a warm solution of sodium bicarbonate (10 grs. to 1 oz.) greatly assists the removal.

C. Drugs that affect the sense of hearing.—Strychnine increases the excitability of the auditory nerve or the auditory centre, thereby increasing the acuteness of hearing. Quinine and salicylic acid create subjective noises, such as ringing, buzzing, &c., which can, to a great extent, be removed by hydrobromic acid dilute or occasionally by ergot.

CLASS XIV.—DRUGS THAT ACT ON THE GENERATIVE SYSTEM

A. Drugs and agents which increase the sexual passion and power are called **aphrodisiacs**. These may be **direct** or **indirect**. The true genital centre being situated at the lumbar portion of the spinal cord, can normally be excited by various afferent impressions brought from various sources, such as eye, nose, ear, mamma, rectum, bladder, prostate, nates, cerebrum and general surface of the body. Drugs can stimulate this centre in the following ways :—

1. Direct Aphrodisiacs act :—

(a) *By increasing the excitability of the nerves passing to or from the genital organs, or of the genital centre, as strychnine, nux vomica, damiana and probably phosphorus.*

(b) *By stimulating the cerebrum and reflexly the genital centre, as opium, cannabis Ind., camphor and alcohol in small doses.*

(c) *By irritating the nerves of the urinary, genital and adjoining structures and thereby reflexly the genital centre, as cantharides, blatta orientalis, acidity of urine, nitrate and chlorate of potash.*

2. Indirect Aphrodisiacs.—They act by removing constitutional disorders and improving the general health. Thus, by curing diabetes, albuminuria, gout, chronic malarial fever, &c., we improve sexual power. Iron, general tonics, alteratives, generous diet, especially meat, indirectly act as aphrodisiacs by improving general health.

Therapeutics.—In functional impotency, both the direct and the indirect aphrodisiacs should be used. Of the direct ones, strychnine, phosphorus and damiana are reliable and useful. Cantharides should be used with great caution.

B. Drugs that diminish the sexual passion and power are called **anaphrodisiacs**. They may also act *directly* or *indirectly*. Thus :—

1. Direct Anaphrodisiacs may act :—

(a) *By lessening the excitability of the nerves of the genital organs, as by the local application of ice and cold bath, bromides.*

(b) *By depressing the excitability of the genital centre*, as by bromides, iodides and conium ; opium, hyoscyamus, belladonna and stramonium in large doses.

(c) *By reducing the circulation of the genital organs or the lumbar portion of the cord*, as by ergot and digitalis.

(d) *By depressing or removing afferent impulses which reflexly excite the genital nerves and genital centre*, as alkalis if due to acid urine.

2. Indirect Anaphrodisiacs are measures of a moral and hygienic nature, such as exercise of the upper limbs, meagre and vegetable diet, avoidance of stimulants, of warm heavy clothing, of feather bed, of obscene works, of amorous songs, of distension of the bladder, of fecal accumulation, and removal of ascarides and of uric acid crystals from the urine.

Therapeutics.—When the sexual passion is abnormally excited, we use both direct and indirect anaphrodisiacs, but the cause of excitement should be looked for and removed. Large doses of bromides are very useful in satyriasis and nymphomania.

C. Drugs that act on the uterus.

1. *Drugs which cause expulsion of the contents of the uterus* are called **ecbolics** or **oxytocics**. They act by contracting the unstriated muscular fibres of the uterus either **directly** or **indirectly**. The direct ecbolics are :—

Ergot	Hydrastis	Suprarenal extract
Quinine	Borax	Cotton root bark
Savin	Drastic purgatives	
Rue	(indirectly)	

Of these, ergot is the most powerful. The action of quinine is uncertain. It generally intensifies and increases the labour-pains. The writer has seen a female who took about 6 drs. of quinine within one week to induce abortion without any effect. All direct ecbolics act as emmenagogues in moderate doses.

2. *Drugs which increase or restore the menstrual flow* are called **emmenagogues**. They may be either **direct** or **indirect**.

(a) **Direct emmenagogues** act by gently stimulating the non-gravid uterus and thus increasing the menstrual flow :—

Ecbolics	Asafetida	Guaiacum	Apiol
(in small doses)	Myrrh	Cantharides	

(b) **Indirect emmenagogues** act :—

(1) *By improving the quality of the blood*, e.g. iron, manganese and cod-liver oil.

(2) *By improving the tone of the nervous system*, e.g. nux vomica and strychnine.

(3) *By increasing the vascularity of the uterus*, e.g. hot hip-bath, hot mustard-bath (see p. 65), mustard poultices and leeches to the thighs and genitals.

(4) *By irritating the adjacent organs or structures and thereby reflexly stimulating the womb, e.g. aloetic purgatives.*

(5) *By removing or neutralizing any specific poison, as of malaria by quinine and iron, or of phthisis by cod-liver oil.*

Therapeutics.—The cause of the suppression of the menstruation should be looked for and removed. If it is due to a sudden chill, aconite and hot hip-baths are very useful. If it is due to anæmia, iron is the best remedy. Delayed or absent flux is restored by permanganate, aloes and myrrh. Sometimes stronger emmenagogues, such as ergot or savin become necessary.

3. *Drugs which depress the uterine contraction* are sometimes called **uterine sedatives or depressants**. As opium, viburnum prunifolium, cannabis Indica, chloral, bromides, tartarated antimony.

D. Drugs that act on the mammary glands.

1. *Drugs which increase the secretion of the milk* are called **galactagogues**; as jaborandi, oils of dill and anise, local application of the leaves of castor-oil plant to the breasts, and alcohol. The action of alcohol is very feeble.

2. *Drugs which decrease or stop the secretion of the milk* are called **antigalactagogues**; as belladonna, either applied locally or given internally.

3. *Drugs which alter the composition of the milk.*

Several drugs are eliminated by the milk and affect suckling babes. Thus rhubarb, senna, jalap, sulphur, scammony, castor oil may produce looseness in children, when given to their mothers. By giving mercury, iodides, iron, and arsenic to the nurse we can affect the infant. Opium should never be given to nursing mothers. Acids given to the mother may cause griping to her child. Copaba, garlic, asafoetida, and oil of turpentine impart a disagreeable flavour to the milk (see p. 117). Salts increase the saline ingredients of the milk.

CLASS XV.—DRUGS THAT ACT ON MICRO-ORGANISMS OR THEIR LIFE PROCESSES IN OR OUTSIDE THE BODY

A. Antiseptics are substances which prevent or retard putrefactive changes, i.e. decomposition of vegetable or animal bodies. They include the following:—

1. **Disinfectants** are substances which destroy pathogenic microbes, i.e. those which cause communicable diseases.

Hydrogen peroxide, mercuric chloride, silver nitrate, chromic acid and copper sulphate are the most powerful. It is doubtful whether any antiseptics taken in medicinal doses can destroy micro-organisms within the body, though many of them are used for this object (see pp. 124 and 130).

2. **Deodorants or deodorizers** are substances which destroy offensive or disagreeable odour. Many antiseptics can remove bad

smells, but potassium permanganate, iodoform, dry charcoal and oils are the most powerful in this respect.

B. Antiparasitics or parasitocides are substances which kill parasites infesting the surface of the body. The drugs which act on intestinal parasites are called **anthelmintics** (*see* p. 130).

These drugs may again be subdivided according to their actions on the different varieties of parasites. Thus we apply for:—

1. Tinea and its varieties : mercurial ointments (*see* p. 60), iodine, carbolic acid (glycerin), pyrogallio acid, salicylic acid, boric acid, thymol, sulphurous acid, formalin, chrysarobin, and local irritants, such as croton oil, cantharides, &c.

2. Scabies or itch : Ung. sulph., sulphur fumigation, storax, Peruvian balsam, sandal-wood oil.

3. The various kinds of Pediculi or Lice : mild mercurial ointments, as Ung. hydrarg. ammon., Ung. staphisagrie, Ung. cocculus Indicus (*kákmári* ointment).

C. Antiperiodics are drugs that prevent the occurrence of certain diseases which tend to return periodically. They probably act by destroying the specific micro-organisms, *e.g.* the malarial parasites causing ague. They are:—

Quinine	Salicin	Rasot	Warburg's tincture
Euquinine	Salicylates	Eucalyptus	Kurchicine
Cinchonine	Neem bark	Iodine	Ditain
Atis	Beberine	Alstonia	Berberine
Arsenic	Methylene blue	Piperine	

Of these, quinine salts, euquinine, arsenic and methylene blue are the most successful.

Therapeutics.—Most of them are given in intermittent fever and intermittent neuralgia. Beberine has been found to be an effective remedy in malarial fevers of pregnant females. Rasot—extract of the bark of *Berberis Aristata*, and *B. Lycium*—gives good results in the chronic malarial fever of children with hepatic derangement. Warburg's tincture is rarely used now. Kurchicine, an alkaloid from the bark of *Wrightia antidysenterica* or *Holarrhena antidysenterica*, is a valuable remedy for chronic dysentery complicating malarial fever. The writer has used it in many cases. Atis, the root of *Aconitum Heterophyllum*, is much esteemed as a febrifuge in this country.

PART V

MATERIA MEDICA AND THERAPEUTICS

(In this part, all the official remedies proper, including their chief non-official preparations and derivatives, will be described. The pharmacopœial or the alphabetical arrangement of drugs will be followed, but the composition of their official preparations will not be repeated (*see* pp. 16-61), except their strengths, doses, and in some instances, their actions, uses and special characteristics.)

ACACIÆ CORTEX. Acacia Bark

N.O. *Leguminosæ*

(*Ind. and Col. Addendum.*)

Synonym Indian Vernacular.—*Báblá chhál*, Beng. *Bábulka chhál*, Hind.

Habitat.—India, Eastern and Australasian Colonies.

Source.—The dried bark of *Acacia arabica*, also of *Acacia decurrens*, the Black Wattle.

Characters.—A hard, brown bark, reddish on the inner surface. Taste astringent.

Composition.—Contains much tannin (20 p.c.).

Incompatibles.—Iron salts and oil, incompatibles of tannin.

Action.—Astringent.

OFFICIAL PREPARATION ;

1. **Decoctum Acaciæ Corticis.**— $1\frac{1}{2}$ ozs. to 24 ozs. of water boiled for 10 minutes. **B.P. Dose.**— $\frac{1}{2}$ to 2 ozs.

PHARMACOLOGY AND THERAPEUTICS

May be used as an astringent injection and gargle, or 1 to 2 oz. doses may be given in diarrhoea.

ACACIÆ GUMMI. Gum Acacia

N.O. *Leguminosæ*

Syn. I. V.—*Gand*, Beng. *Babul-ka-gand*, Hind.

Habitat.—Kordofan.

Source.—A gummy exudation from the stem and branches of *Acacia senegal* and of other species of *Acacia*.

Characters.—Ovoid or round tears or masses, colourless, glistening, or yellowish angular fragments; odourless; taste mucilaginous. **Solubility.**—Entirely in water, insoluble in alcohol. **Impurities.**—Starch, dextrin, tannic acid, sugar, mineral matters, and inferior gums of many species of *acacia* and of other plants found in India.

Enters into.—Acet. Scillæ and Liq. Morph. Acet.

2. **Oxymel.**—4 in 5. Expectorant. **B.P. Dose.**—1 to 2 drs.

NON-OFFICIAL PREPARATION

1. **Acidum Trichloraceticum.** **P.G.**—In deliquescent crystals. A 1 per cent. solution is a powerful stimulant for granulating surfaces, and is also a very useful application for the phagedenic ulcerations of the cheek which are so common in the terminal stages of malarial cachexia and Leishman Donovan disease.

ACIDUM ACETICUM GLACIALE

Glacial Acetic Acid

Source and Characters.—A concentrated, colourless liquid, with a very pungent odour, containing 99 p.c. of hydrogen acetate. Crystallizes below 60° F. Sp. gr. 1.058. **Solubility.**—Freely in water and absolute alcohol. **Impurities.**—The same as those of Acetic Acid.

Action.—Escharotic.

Enters into.—Acet. Canth., Lin. Terebinth. Acet., and Liq. Ferri Acet.

NON-OFFICIAL PREPARATION

1. **Acetum.** *Vinagar.*—Contains 5.41 p.c. of hydrogen acetate. An acid liquid obtained by the acetous fermentation of malt and unmalted grains. **Dose.**—1 to 8 drs. Country vinegar (*sirki*) is made from the saccharine juice of plants.

PHARMACOLOGY AND THERAPEUTICS

The action of acetic acid resembles more or less that of the mineral acids.

Externally.—Glacial acetic acid is a **caustic** and is therefore used in destroying **corns, warts** and small **cancerous growths**. It speedily **vesicates**, and may be used in those cases where cantharides cannot be employed, but it causes much pain, and if not cautiously applied, may produce a nasty sore. When inhaled, in the form of aromatic vinegar, it reflexly stimulates the vaso-motor centre and increases blood-pressure, and is useful in **syncope** and **cardiac depression**.

Acetic acid destroys **tinea**, and is an effective application for ring-worm. Vinegar or diluted acetic acid is an **external refrigerant**, and may be used as a **cooling lotion** in **cerebral congestion, sprains** and **bruises**; and sponging with vinegar will **reduce pyrexia** and **check excessive sweating**. Vinegar is sometimes used topically to check **epistaxis**, &c.

Internally.—Diluted acetic acid **allays thirst** by increasing the salivary secretion, and may be used as a **gargle** (15 ms. to 1 oz.) in cases where dryness of the mouth is a troublesome symptom.

After prolonged use, it diminishes the number of red blood corpuscles, and therefore its employment in **obesity** is contra-indicated. As an

internal refrigerant, it may be given in **fevers, cholera, diabetes, Bright's disease, &c.**

Acetic acid is excreted in the urine as a carbonate. Given in large doses it passes out unchanged.

Antidotes.—The same as those for the mineral acids. No stomach pump.

Prescribing hints.—Used diluted with water. As a caustic undiluted.

ACIDUM ARSENIOSUM

Arsenious Anhydride. As_2O_3 .

Syn. B.P.—Arsenic. White Arsenic. Arsenious Acid. **Syn. I. V.**—*Sarkhid. Hind. Sanko, Simulakhid, Beng.*

Source.—Prepared by roasting certain arsenical ores.

Characters.—A heavy white powder or in stratified opaque masses. **Solubility.**—1 in 100 of cold, 1 in 10 of boiling water, and 1 in 5 of glycerin. **Impurities.**—Lead, antimony, in, cadmium, gypsum, and chalk.

Identification.—Arsenious anhydride resembles pieces of broken china in appearance. Its white porcelain-like appearance, glassy fracture and weight are characteristic. In crystalline form an expert can readily recognise it, but there is nothing characteristic about the powder.

Tests.—(1) Its aqueous solution gives a canary-yellow precipitate with silver ammonio-nitrate, readily dissolved by ammonia solution and nitric acid. (2) Sprinkled over ignited charcoal it emits a garlic-like odour. (3) In organic solution, arsenic is detected by adding HCl and distilling, when the volatile chloride is found in the distillate. (4) Acidulated with HCl, it gives a yellow precipitate with H_2S . (5) Marsh's and Reinsch's special tests.

Incompatibles.—Lime water, iron salts, magnesia, and astringent substances.

Action.—Alterative, tonic, antiperiodic, caustic.

B.P. Dose.— $\frac{1}{10}$ to $\frac{1}{4}$ gr. **S. M. Dose**— $\frac{1}{12}$ gr. **Daily Dose.**—About $\frac{1}{2}$ to $\frac{1}{4}$ gr.

OFFICIAL PREPARATIONS

1. **Liquor Arsenicalis.** **Syn.**—*Liq. Potassæ Arsenitis, Fowler's Solution*—1 gr. in 110 ms.* Pinkish, alkaline with a lavender odour. **B.P. Dose.**—2 to 8 ms. diluted.

2. **Liquor Arsenici Hydrochloricus.**—1 gr. in 110 ms. This is three times the strength of De Valangin's Solvent. A colourless acid liquid. **B.P. Dose.**—2 to 8 ms. diluted.

ARSENII IODIDUM

Arsenious Iodide. AsI_3 .

Source and Characters.—Small, soluble, orange-coloured crystals, prepared by the direct combination of iodine and arsenic.

Action.—Tonic, alterative, antiperiodic. **B.P. Dose.**— $\frac{1}{20}$ to $\frac{1}{4}$ gr. **S.M. Dose.**— $\frac{1}{12}$. **Daily Dose.**— $\frac{1}{4}$ gr., in pill or solution.

* 1 gr. in 110 ms. is equivalent to a 1 p.c. solution.

OFFICIAL PREPARATION

1. **Liquor Arsenii et Hydrargyri Iodidi.** *Syn.*—*Donovan's Solution*.—1 gr. in 110 ms. A colourless acid liquid. **Action.**—Alterative, anti-syphilitic. **B.P. Dose.**—5 to 20 ms.

FERRI ARSENAS. Iron Arsenate

Source and Characters.—A tasteless, amorphous, greenish powder prepared by the interaction of ferrous arsenate with ferric arsenate and iron oxide.

Identification.—Recognised by its *green* colour. Be careful not to mistake it for iron phosphate, which is *blue*.

Action.—Alterative, tonic, like Arsenious Acid.

B.P. Dose.— $\frac{1}{10}$ to $\frac{1}{4}$ gr. in pill (*see pp.* 85, 88).

SODII ARSENAS. Sodium Arsenate

Source and Characters.—A soluble white powder obtained by exposure to 300° F. crystallized sodium arsenate, which may be prepared by treating with water the product of the fusion of arsenious anhydride with sodium nitrate and sodium carbonate. **B.P. Dose.**— $\frac{1}{10}$ to $\frac{1}{5}$ gr. in pill.

OFFICIAL PREPARATION

1. **Liquor Sodii Arsenatis.**—1 gr. in 110 ms. (Pearson's Solution 1 in 600.) A colourless solution having half the strength of Liq. arsenicalis.

Action.—Produces less gastric irritation. Cures eczema readily. **B.P. Dose.**—2 to 8 ms.

NON-OFFICIAL PREPARATIONS OF ACIDUM ARSENIOSUM

1. **Abernethy's Lotion.**—Liq. Arsenicalis 2 drs. to water 1 oz.

2. **Arsenical Cigarettes.**—Each contains $\frac{3}{4}$ gr. of Sodii Arsenas. The smoke is to be inhaled deeply three or four times.

3. **Cupri Arsenis.**—A pale-green amorphous powder. Useful in cholera, diarrhoea, dysentery, enteric fever in doses of $\frac{1}{1000}$ gr. every 10 minutes for one hour and then hourly, for adults. For anaemia, chlorosis, $\frac{1}{10}$ to $\frac{1}{4}$ gr. three daily.

4. **Liq. Arsenici Bromatus.** *Syn.*—*Clemens' Solution of Arsenite of Bromine.*—Useful in diabetes and epilepsy. **Dose.**—1 to 5 ms.

5. **Liq. Auri et Arsenii Bromidi.** **N.F.**—Acid Arsenious 2.5 grm., The bromide of Gold 3.25 grm., Bromine Water *q.s.*, Distilled Water *q.s.* to 1000 c.c. In syphilis, neurasthenia. **Dose.**—1 to 2 ms.

6. **Pasta Arsenicalis** (dental).—Arsenic 4, Cocaine Hydro. 4, Menthol. Glycerin *q.s.* M. A piece of the size of a pin-head is to be put into the cavity of the tooth to destroy the dental nerve. A plug must then be inserted above the fragment of paste.

7. **Pasta Arsenici Escharoticus.**—Arsenic 1, Charcoal 1, Red Sulphide 3, Mercury 4, Aqua q.s. To destroy lupus, epithelioma, &c.

8. **Pilula Asiatica** (Codex).—Acid Arsenious $\frac{1}{4}$ gr., Black pepper $\frac{1}{4}$ gr., Acacia q.s. M. In many chronic skin diseases. *Dose.*—1 to 2 daily.

9. **Unguentum Arsenicalis** (Sir A. Cooper's).—Acid Arsenious 1 dr., Sulphur 1 dr., Spermaceti Ointment 1 oz. Applied for 24 hours.

PHARMACOLOGY

Externally.—Arsenic has no action on the unbroken skin, but on the denuded surface it is a powerful **irritant and caustic**. Unless applied in a concentrated form, poisoning may take place from absorption.

Internally. **Alimentary tract.**—In minute doses ($\frac{1}{10}$ to $\frac{1}{2}$ gr.) it increases the gastric vascularity and secretion, and thus improves appetite and digestion. It is therefore a **local gastric stimulant and stomachic**. In large doses it is a powerful **gastro-intestinal irritant**. It is excreted into the stomach after absorption, even when subcutaneously injected.

Blood.—It is quickly absorbed, and has no action on the blood, except in anemias of the pernicious type, where it increases the number of red corpuscles.

Heart and circulation.—In very small doses ($\frac{1}{2}$ to 1 m. of the solution), it increases the force and the number of cardiac beats. In large doses, it reduces blood-pressure and pulse-rate.

Metabolism.—Arsenic passes through all the organs and tissues, and is not known to combine with their albuminous constituents, though Dogiel says it does. During its brief stay in the tissues, it performs certain important functions. According to Binz and Schulz, it is a carrier of oxygen, which it receives and gives up, by the transformation of arsenious into arsenic acid at the expense of the oxygen of the protoplasm, and by the reduction of arsenic into arsenious acid by the venous and capillary blood. In the liver, it reduces the formation of glycogen, and produces when continued for any length of time a fatty degeneration. In other organs, it behaves in the same way, by interfering with their metabolic processes, and helping the deposition of fat. Short of this action, it **stimulates the general metabolism** of all organs and tissues, and **alters** their activity in such a subtle way, that many abnormal conditions of the system due to faulty nutrition are benefited. Therefore, it is a **general tonic and alterative**.

Respiration.—We do not know much about its action on respiration except that habitual eaters of arsenic, such as the Styrian peasants, can undergo great bodily exertion without much difficulty and distress of breathing.

Nervous system.—In minute doses it acts as a **nervine tonic**. In large doses it diminishes the sensibility and reflex excitability of the

centres, and is found in the grey matter of the cord. Motor nerves and muscles are affected later on (peripheral neuritis).

Skin.—Arsenic has a marked effect on the nutrition of the skin, it improves the cutaneous nutrition and subcutaneous fat. It is eliminated with the sweat, and causes itching and **eruptions**, which may be erythematous, papular, pustular, furuncular, pigmentary or urticarial. Darkening of the skin, "*arsenical melanosis*," is also seen, and this may vary from slight pigmentation to a deep brownish-red. The skin of a frog poisoned by arsenic can be stripped off easily.

Bone.—Like phosphorus, it increases the compact tissue at the expense of the medullary.

Micro-organism.—It is believed to affect the life-processes of the micro-organisms of certain diseases, such as malaria, phthisis, &c.

Elimination.—It is excreted chiefly in the urine as arsenious acid, also in the bile, sweat, saliva, tears and gastro-intestinal secretion, but not in the milk.

Toleration can be induced, though instances of death from an over-dose are not infrequent.

Acute toxic action.—Colicky pains, severe vomiting and purging, cramps of the legs, intense thirst, prostration, and collapse are the prominent symptoms, which may be mistaken for those of cholera. At the *post-mortem* the stomach and intestine are found inflamed, with occasional patches of softening of the mucous membranes. *Fatty degeneration of the liver, kidneys, and heart* is found if the patient survives long enough. Sometimes there may not be any gastro-intestinal irritation, death taking place during profound coma.

Antidotes.—Emetics, apomorphine. The pump must be used with great caution. Moist peroxide of iron freshly prepared by mixing tincture of steel with sodium or ammonium carbonates and straining rapidly through muslin, or dialysed iron in 1 oz. doses diluted, or in their absence magnesia, animal charcoal, olive oil, lime water freely. Demulcents, and castor oil to clear the intestine, stimulants, hot-water bottles, &c.

Chronic toxic action.—Chronic poisoning occurs amongst those who either handle arsenical pigments, inhale arsenical dust from wall-paper, dresses, &c., or consume wines* containing traces of arsenic. Loss of appetite, nausea, vomiting, colic, mild diarrhoea, oedema of the lower eyelids, conjunctivitis, swelling of the joints are the symptoms generally observed, when arsenic is continued long medicinally in large doses. Peripheral neuritis, muscular paralysis of the limbs, ataxic gait, muscular atrophy, bronzing, and patchy pigmentation of the skin and darting pains in the limbs are also noticed in many cases of slow poisoning.

* Peripheral neuritis was a marked symptom in an outbreak of arsenical poisoning in England, due to drinking contaminated beer. A case is also reported by Dr. A. Buchanan from Nagpur.

THERAPEUTICS

Externally.—An arsenical paste is used for destroying new growths, such as **lupus**, **condyloma**, **epithelioma**, &c., but it must be concentrated, and only a limited surface is to be treated if the disease is extensive. The cancer-curers of North Ireland use arsenic as the chief basis of their remedies. Small **warts** and **corns**, after the paring of the hard skin, can be removed by painting with *Liquor Arsenicalis*. Arsenical cigarettes are sometimes smoked for the relief of **asthmatic fits**, and **phthisical dyspnoea**, but such inhalation must be given with caution.

Internally. **Gastro-intestinal tract.**—Dental arsenical paste is employed to destroy the tooth-pulp in **caries** of the tooth, before stopping. In minute doses before meals, arsenic may be given in **irritative dyspepsia**, **vomiting of habitual drunkards**, **vomiting or diarrhoea** excited by food, **gastric neuralgia** and **chronic ulcer** and **cancer of the stomach**. For other diseases of the alimentary tract, such as **cancerum oris** and **malignant sore throat**, it is given after food.

Heart and lungs.—In minute doses ($\frac{1}{4}$ to 1 m. of the solution), it tones up the heart in **angina** and exhausting febrile and other diseases. Prolonged administration checks the repetition of **asthmatic fits**. It gives signal benefit in paroxysmal **coryza**, **hay asthma** and wheezing of **emphysema**, **spasmodic bronchitis** and **chronic catarrhal pneumonia**. According to Brunton, it arrests **incipient phthisis**, by causing degeneration of the inflammatory nodules, and thereby preventing the bacillus from finding a suitable nidus.

Malaria.—It is both curative and prophylactic in malarious diseases, such as **ague** and **intermittent neuralgia**. A few cases of **relapsing fever** have yielded to arsenic in the writer's hands. In chronic malarious fever, it must be given in fairly large doses ($\frac{1}{4}$ to $\frac{1}{2}$ gr.). The writer considers arsenic to be a useful remedy for arresting the paroxysmal febrile attacks of **elephantiasis arabum**, but it must be continued for 18 to 24 months, as one of his patients got a relapse after one year's treatment.

Nervous system.—In large doses, arsenic cures **chorea**. Children over four or five years of age can bear as large doses as adults. Beginning with 5 m. doses, liq. arsenicalis may be pushed on to 15 ms. three or four times a day. Occasionally its action is very prompt if it is commenced in 10 to 15 m. doses, twice daily. Gowers speaks lightly of it in **locomotor ataxy**. Many other spasmodic diseases, especially **pertussis** and **angina** are markedly benefited by it.

Kidneys.—Dr. Murray strongly recommends arsenic in **diabetes mellitus**. He uses 10 ms. of the solution three times a day for two or three months, after reducing the sugar by codeine. Occasionally it is prescribed in chronic **Bright's disease**.

Lymphomas.—In **Hodgkin's disease** (general lymphadenoma), no remedy is known to be of any use except arsenic. Large **lymphomas** are said to have been absorbed by the continued use of arsenic internally and hypodermically.

Anæmia.—Arsenic is of great value in **primary anæmia**. In **pernicious anæmia** it materially improves the number of red blood corpuscles and the hæmoglobin, in **leukaemia** it is often used in large doses, but the beneficial effects of arsenic in these conditions appear to be only of a temporary nature. Arsenic is also useful in anæmia following an attack of malaria, and some clinicians use it in **chlorosis**, but it appears that beyond the general improvement of nutrition and lessening breathlessness and to a certain extent acting as a heart tonic, it has no specific action in chlorosis when used alone. Combined with iron, however, it is said to hasten the cure by increasing the formation of red blood corpuscles.

Skin.—Chronic skin diseases, especially **scaly** and **papular** varieties are wonderfully benefited by arsenic. **Psoriasis**, **lichen**, **chronic eczema**, **acne**, **pemphigus**, &c., yield to it. It seems to act specially well in diseases affecting the epidermis than other portions of the skin. The writer used it in two cases of true **leprosy** with good result, but they came under his treatment at the beginning of the disease. Within two months the eruptions disappeared. **Leucoderma** too is benefited by it.

Caution.—(1) Never use arsenic during the inflammatory stage of any cutaneous disease.

(2) Always administer after food and well diluted, except where its local action on the stomach is desired.

(3) Arsenites are more active than arsenates.

(4) As soon as itching, smarting, or irritation of the conjunctivæ, œdema of the lower eyelids, pain in the pit of the stomach, or symptoms of neuritis are noticed, the dose must be reduced to one-fourth or one-fifth. If the irritation does not subside, it must be further diminished, or stopped altogether.

(5) If the skin becomes irritated, a laxative may be given, rather than the treatment be stopped.

(6) For the radical cure of a chronic skin disease it must be continued for some months after the final disappearance of eruptions.

(7) Children over 5 years of age can bear as large doses as adults.

(8) Old people bear it badly.

Prescribing hints.—Solid arsenic is given in pills, and can be divided as directed in para. 12, p. 77. With an alkaline mixture, Fowler's solution should be prescribed, and with an acid one, Liq. Arsenici Hydrochlor. Sometimes it is used hypodermically as in multiple sarcomas, but with doubtful benefit.

ORGANIC ARSENIC COMPOUNDS

These compounds have come to occupy an important position among the therapeutical agents in recent years. They are of two distinct classes, viz. those derived from—

- (1) The Aliphatic or Fatty series, and
- (2) The Benzol ring compounds or Aromatic compounds.

The distinctive feature of these compounds lies in the fact that the arsenic in them is in direct chemical combination with a carbon atom, and this appears to greatly lessen their toxic properties, and makes it possible to administer arsenic with safety in much larger quantities than is otherwise possible, and its therapeutical utility is consequently greatly extended.

Arsenic acid, $\text{AsO}(\text{OH})_3$, is capable of having one or more of its hydroxyl (OH) radicals replaced by an organic group, and generally speaking the greater this substitution the greater is the reduction of its toxicity. *Arsenic Acid* indicates arsenic acid in which one of the hydroxyls is replaced by an organic radical—the salts of this acid are called *arsonates*; if the substituted radical belongs to the aromatic or benzol series, the compound is called *Aryl-arsenic acid*, and its salts are called *Arylarsonates*.

1. ALIPHATIC SERIES

ACIDUM CACODYLICUM. Dimethylarsinic Acid



Dose.— $\frac{1}{2}$ to 2 grs.

It will be seen that this acid has only one OH group, hence it is not so toxic as its parent arsenic acid, $\text{AsO}(\text{OH})_3$. It is soluble 2 in 1 of water and 1 in 4 of alcohol (90 p.c.). The cacodylates appear in an unaltered condition in the urine, or are broken down in the body so little that they may be administered over prolonged periods, and in big doses without producing any toxic effects. The chief cacodylate preparations are:—

1. **Ferri Cacodylas.**—A yellowish powder, soluble 1 in 15 of water. *Dose.*— $\frac{1}{4}$ to 5 grs. per os per diem and $\frac{1}{2}$ to 1 $\frac{1}{2}$ grs. hypodermically per diem. Chiefly used for *anæmia* and *chlorosis*.

2. **Guaiacol Cacodylas.** *Syn.*—*Cacodyliaccol.*—Chiefly used in *tuberculosis*. *Dose.*— $\frac{1}{2}$ to 2 grs. per os or dissolved in sterile oil hypodermically.

3. **Strychnine Cacodylas.**—A white crystalline powder practically insoluble in water. Chiefly used in those conditions in which a combination of strychnine and arsenic are required. *Dose.*— $\frac{1}{10}$ to $\frac{1}{2}$ gr.

4. **Sodii Cacodylas.**—*Sodium Dimethylarsinate.*—It is used in all cases in which arsenic has been used, and is valuable in chronic skin affections. Given in doses of 1 to 2 grs. *intramuscularly*. Murphey of Chicago has found it to be of great value in *sypphilis*, the spirochaetes being rapidly destroyed. A palatable method of administering the salt is the **Elixir Sodii Cacodylatis**, 30 ms. of which are equivalent to $\frac{1}{2}$ gr. of the salt. It may also be given in pill form. **Sterules** containing 0.05 grm. ($\frac{1}{2}$ gr.) are now on the market and are convenient for hypodermic use.

Dose.—Hypodermically $\frac{1}{2}$ to 1 gr., but it may be increased to 3 grs. as

maximum single dose, and as maximum dose in 24 hours. If given by mouth or per rectum it may cause renal congestion with a fall of urinary secretion.

5. **Di-Sodium Methylarsenate.** *Syn.*—*Arrhenal*, “*New Cacodyl.*”— $\text{Na}_2\text{AsCH}_3\text{O}_3\text{H}_2\text{O}$. Soluble 1 in 1 of water and sparingly in alcohol. Its arsenic content is 37.1 p.c. Its uses are the same as sodium cacodylate.

Dose.— $\frac{1}{2}$ to 3 grs. by mouth, or hypodermically; the *maximum dose* (single or in 24 hours) being 3 grs.

6. **Magnesii Cacodylas.**—A white amorphous powder, soluble 1 in 3 of water. *Dose.*— $\frac{3}{4}$ gr. hypodermically. Uses similar to those of sodium cacodylate.

2. AROMATIC (BENZOL) SERIES

In recent years the Benzol ring series of organic arsenic compounds have rapidly come to the front, and in a great measure have supplanted the cacodylates.

1. **Sodii para-aminophenylarsonas.** *Syn.*—*Soamin*, *Atoxyl*, *Arsamin*— $\text{C}_6\text{H}_7\text{NAsO}_3\text{Na}$. A white crystalline powder with a saline taste, soluble 1 in 3 of water at body temperature. Solutions, which should be freshly prepared, may be sterilized by boiling for five minutes without becoming decomposed. Its arsenic content should be at least 22.8 p.c.

Dose—*Per mouth* $\frac{1}{4}$ to 1 gr. (0.016 grm. to 0.065 grm.) twice or thrice daily after food. *Maximum daily dose.*—3 grs. *Hypodermically*, 1 to 3 grs. (0.065 grm. to 0.2 grm.), *intramuscularly* high up into upper third of buttock on alternate days. The salt should be dissolved in sterile water. *The maximum of 3 grs cannot be exceeded with safety.*

USES

It has been used very successfully in **syphilis** given intramuscularly, and provided the precautions to be hereafter noted are attended to, no bad effects or signs of toxicity should follow. It appears to be of value in all stages of syphilis, often where mercury has had no effect.

In **Trypanosomiasis**—human and animal—the drug has been largely used and with much success, but in many cases recurrence of the disease has occurred. It seems to do more permanent good when combined with mercury as the **Hydrargyri Arsanilas** (Mercury atoxilate).

It has been used with much success in anæmic conditions, locomotor ataxy, relapsing fever, pellagra, cerebro-spinal meningitis, tuberculosis and chronic skin diseases (psoriasis and lichen).

Precautions.—Valuable as is the drug, several cases are now on record of blindness due to optic atrophy following its use. This possibly was due to an unsafe dosage being used, but as idiosyncrasy and previous optic degeneration are important factors, it is necessary to proceed with caution when using the remedy. The following are the points to which attention should be paid:—

1. Always examine the retina and the discs for degenerative changes before commencing a course of treatment, and if normal, periodically test the vision and look for any contraction of the fields—if any contraction stop use of the remedy.

2. In cases of renal and hepatic disease, and in arterio-sclerosis, do not use the drug, and only use it with great caution for this reason in old patients.

3. When 100 grs. have been given stop for four weeks.

The earliest toxic symptoms to be carefully watched for are insomnia, gastric pain and haziness of vision.

2. **Arsacetin.** *Syn.*—Sodium Acetyl - para - amino - phenyl - arsonate.— $(C_2H_5O.NH.C_6H_4.AsO(ONa)(OH).5H_2O$. It has been used with much success in syphilis and trypanosomiasis. In syphilis the cases respond in a marked manner, in trypanosomiasis it is therapeutically the equal of atoxyl, and a more stable preparation. It is also useful in anæmias; in such cases however a smaller dose, *viz.* 0.1 grm. to 0.5 grm., should be given subcutaneously. As with atoxyl caution in its use is to be recommended, as cases of blindness have been reported after its use.

Dose.— $\frac{1}{2}$ to 3 grs. Per os 0.05 grm. ($\frac{1}{2}$ gr.) three to four times daily. *Intramuscularly* a maximum of 3 grs. in 10 p.c. solution should not be exceeded, and for syphilis and trypanosomiasis a dose of 0.6 grm. in 10 p.c. solution is a good average dose. If administered hypodermically the solution, needle, and syringe should be warmed.

3. **Orsudan.** *Syn.*—Sodium Methylacetyl - para - amino - phenyl - arsonate. —In white amorphous powder, soluble 1 in 4 of water, the solutions may be sterilized by boiling. It contains 25.4 p.c. arsamin. It has been used with good results per os in anæmias and chronic skin disease, but great caution is required in its use, specially in old and debilitated people.

Dose per os.— $\frac{1}{2}$ to 1 gr. thrice daily two hours after food. *Intramuscular injection* 3 grs. on alternate days.

SALVARSAN. Dioxy-diamino-arseno-benzol-di-hydrochloride



Syn.—Arseno-Benzol. Ehrlich-Hata, "606."

This drug was introduced after long-continued research by Ehrlich and his assistants, notably S. Hata of Tokio. It was brought forward originally for the treatment of syphilis, but since that time the therapeutic effects of salvarsan have been tried on a very large scale in many other affections, and the literature on the subject has now reached enormous proportions.

Characters.—It is a bright yellow powder, containing 34 p.c. of arsenium. It is soluble 1 in 5 of water, forming a thick syrup-like liquid with a marked acid reaction.

Methods of Injection.—(1) *Intramuscularly*, into the gluteal muscles.

(2) *Subcutaneously*, into the tissues adjoining bases of the shoulder-blades.

(3) *Intravenously*. In this method the dose is given greatly diluted, 200 to 250 c.c. of diluent being employed.

(4) *Intravenously followed by intramuscular injection*. In cases in which one wants to prolong or intensify its action.

N.B.—All solutions must be freshly prepared.

Dose (average).—

A. *Intramuscular or subcutaneous* : (1) Men 0·5 grm., but in strongly built adults 0·6 grm. to 0·8 grm. may be given.

(2) Women, 0·4 grm.

(3) Children, 0·2 grm. to 0·3 grm.

B. *Intravenous* : (1) Men, 0·4 grm. to 0·5 grm.

(2) Women, 0·3 grm.

A further injection may be given in ten days, but it is better to wait, if possible, for three to four weeks.

The best method of injection is **intravenously**. It is practically painless and there are seldom objectionable local effects at point of injection; if any should arise it may be ascribed to faulty technique. The time spent in bed is greatly reduced by this method. Whatever method is used the strictest asepsis must be maintained.

Preparation of solutions.—*Intramuscular*.—Place the required salvarsan in a small porcelain dish and rub it with 9 to 10 drops of sodium hydrate solution 15 p.c. by weight, then add (carefully rubbing all the time with a glass rod) drop by drop the required amount of *fresh distilled water*, about 5 to 10 c.c. Neutralize the solution by the addition of sodium hydrate or dilute hydrochloric acid.

After an intramuscular injection rest in bed for 3 or 4 days should be enjoined, as after-pain frequently follows the injection. This pain may be relieved by a sitz-bath.

Intravenous.—Place 30 to 40 c.c. physiological salt solution in a 300 c.c. stoppered bottle, add to this 0·6 grm. of salvarsan. Dissolve it by thorough shaking, add 23 drops of 15 p.c. sodium hydrate solution. A precipitate forms which quickly re-dissolves. Dilute the remaining clear yellow solution to 300 c.c. with normal saline solution.

Each 50 c.c. is equal to 0·1 grm. Therefore 150 c.c. form the average dose for women and 200 c.c. for men.

The injection should be made with all aseptic precautions into the vein at the bend of the elbow, the rate of flow being about 30 c.c. per minute. A little saline should first be run in, then the salvarsan, and finally a little saline to clear the neighbourhood and needle.

The after-effects are a slight rise in the temperature, often headache and sickness, a sense of cardiac oppression, and pains in the limbs. The injection should never be given on a full stomach or when the blood-pressure is high, or alarming results may follow. It should not be given to cases with chronic renal disease, with diabetes or chronic myocardial degeneration, or to cases exhibiting evidences of recent endocarditis.

Caution.—As far as can be gathered from the literature, about 150 deaths are on record as having followed the use of salvarsan. This cannot be considered a large number considering the hundreds of thousands of injections which have been given. Many of these deaths may fairly be attributed to faulty technique and gross disregard to well-known contraindications. But a few must be ascribed to the fact that a small proportion of patients are susceptible to salvarsan.

USES

The great advantage of salvarsan over mercury is its remarkably rapid effect on **syphilitic lesions**, whether primary, secondary or

tertiary. In the British Army the routine use of salvarsan in syphilis has led to an enormous reduction in inefficiency from this disease; but the opinion gaining ground is that the results of salvarsan alone will not compare with the results obtained when salvarsan is used in conjunction with intramuscular injections of mercury.

Recent reports of the use of salvarsan in **pernicious anaemia** have been most favourable, and justify extended trials. In such cases smaller doses (0.2 to 0.3 grm.) should be used. It has also been used in **malaria**, **yaws**, **relapsing fever**, **plague**, **leprosy**, **frambæsia** and various other diseases, with varying results. It is possible that it is being used not wisely and without due thought and care, and it is probable that more careful selection of cases will be essential in the future.

Neo-Salvarsan.—This produces much the same effect on syphilis as salvarsan. It is convenient in that it is very soluble in water and can be given at once. The solutions are neutral. Reaction is not so common as with salvarsan. The drug is very unstable, and its use demands greater care in its administration and, if possible, more punctilious regard to detail than salvarsan.

ACIDUM BENZOICUM. See Benzoinum

ACIDUM BORICUM

Boric Acid. H_3BO_3

Syn. B.P.—Boracic Acid. Hydrogen Borate.

Source.—Obtained by the purification of native boric acid, or by the interaction of sulphuric acid and borax.

Characters.—Colourless, pearly, lamellar crystals, unctuous to touch, odourless. Taste slightly acid and bitter. **Solubility.**—1 in 30 of cold water, 1 in 3 of boiling water, 1 in 4 of glycerin, 1 in 30 of alcohol (90 p.c.), which burns with a green flame. The *greasy feel* of powdered boric acid is to be noted for its **identification**.

Incompatible.—Sodium salicylate in powder.

Action.—Antiseptic, diuretic. **B.P. Dose.**—5 to 15 grs.

OFFICIAL PREPARATIONS

1. **Glycerinum Acidi Borici.**—6 in 16 (by vol.). A substitute for Boroglyceride. Powerfully antiseptic.
2. **Unguentum Acidi Borici.**—1 in 10. An antiseptic application.

NON-OFFICIAL PREPARATIONS AND DERIVATIVES

1. **Boric Collyrium.**—2 to 10 grs. to 1 oz.
2. **Boric Gargle.**—10 to 15 grs. to 1 oz.
3. **Boric Dressings.**—**Boric Gauze.**—20 p.c. **Boric Lint.**—50 p.c. **Boric Lotion.**—1 in 20. **Boric Wool.**—50 p.c.
4. **Boric Pessary.**—10 grs. each.

5. **Boric Suppository.**—3 grs. each.

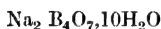
6. **Branalcan.**—A rose coloured compound of Boro-glycerin. An antiseptic pigment in diphtheria, and throat, nose, and skin affections.

7. **Boro-glyceride.**—A tough deliquescent mass, soluble in water and alcohol, obtained by heating glycerin 92 parts with 62 of boric acid. A patented preparation. Powerfully antiseptic.

8. **Magnesii Boro-citras.**—In white powder or colourless scales. An internal urinary antiseptic. *Dose*—15 to 30 grs.

9. **Pigmentum Acidi Borici.** *Syn.*—*Solutio Saturans.*—Boric Acid 1, Ether 3, Alcohol (90 p.c.) 6. *Mix.* Used in ringworm, &c.

BORAX. Borax



Syn. B.P.—Biborate of Sodium. *Syn. IV.*—*Shohágá*, Beng., Hind.

Source.—A native salt, or obtained by neutralizing native boric acid with sodium carbonate, or by boiling native calcium borate with solution of sodium carbonate. (Impure borax is largely imported from Nepal.)

Characters.—Transparent, colourless, odourless, efflorescent crystals, with a weak alkaline reaction. *Solubility.*—1 in 25 of cold water, 1 in 1 of glycerin. It gives a yellow colour to the flame.

Incompatibles.—Mineral acids, most metallic salts, mucilage of acacia, also alkaloidal salts, *e.g.* cocaine hydrochloride.

Action.—Antiseptic, emmenagogue, diuretic.

B.P. Dose.—5 to 20 grs.

OFFICIAL PREPARATIONS

1. **Glycerinum Boracis.**—1 to 6½ or 1 in 8½ by weight. *Dose.*—½ to 1½ dr. An external and internal antiseptic.

2. **Mel Boracis.**—1 in 9½. An antiseptic soothing application to inflamed mucous membrane. Especially useful in "thrush."

NON-OFFICIAL PREPARATIONS

1. **Lotio Boracis.**—Borax 1, Rose water 24; or Borax 1, Glycerin 1, Rose water 16. A cosmetic.

2. **Trochisci Boracis, T. H.**—Each contains 3 grs. of borax. Used in thrush.

3. **Tr. Myrrh. et Boracis.**—Myrrh 1, Eau de Cologne 16, Borax 1, Water 3, Syrup 3.

PHARMACOLOGY OF BORIC ACID AND BORAX

Externally.—Both boric acid and borax are non-irritating and mild antiseptics, antiputrefactives and disinfectants. They kill micro-organisms, but their action is entirely local. Some skins, however, are very sensitive to the action of boric acid, which is apt to produce a troublesome herpes in such cases.

Internally. **Gastro-intestinal tract.**—Some authorities affirm that they prevent the conversion of starch by the saliva, while others

deny it. At any rate, they do not check the peptonizing action of gastric and pancreatic secretions, but rather stimulate them slightly. In large doses they retard these processes and act as **gastro-intestinal irritants**.

Urinary tract.—Boric acid is rapidly excreted in the urine, causing increase in the elimination of both water and urea. Small doses increase the acidity of the urine, large doses decrease it. The administration of a few doses often has a marvellous effect in rendering a foul alkaline urine perfectly clean and sweet. It is also **eliminated** by the saliva, sweat and faeces.

Nervous system.—Both produce a sedative action on the nervous system.

Generative organs.—Borax promotes menstrual flow and uterine contractions, it is therefore an **emmenagogue** and **ecbolic**.

Toxic action or Borism.—Poisoning may occur from absorption. Weakness, dryness of the skin, nausea, vomiting, anorexia, red and inflamed mucous membranes, papular and squamous rashes on the skin, albumen in the urine, are the chief symptoms.

THERAPEUTICS OF BORIC ACID AND BORAX

Externally.—Boric acid is used as a food preservative. Being a non-irritant, it is largely employed in surgical dressings. The ointment is applied to **wounds, ulcers** and **burns**. As its action is entirely local its use is of no value in deep suppurating cavities. It is used as an eye-wash in **ophthalmia**, and as an injection in **leucorrhœa, gonorrhœa, ozœna**, (10 grs. to 1 oz.), and **otorrhœa**. The writer plugs the vagina with boric cotton impregnated with boric acid in leucorrhœa, and either injects a saturated warm solution or insufflates the powder in otorrhœa. In **cystitis**, the irrigation of boric acid (1 in 100) is a capital local application. Thompson's fluid (borax 1 oz., glycerin 2 ozs., and water 2 ozs.) in $\frac{1}{2}$ to 4 ozs. of warm water is also very serviceable in **cystitis**. **Pityriasis** of the body and scalp, **eczema** of the ear and scalp, and **cracked nipples** are benefited by boric acid applications. Borax (1 dr. to water 4 ozs.) removes **prurigo** of the labia and anus. The wearing of socks soaked in a warm saturated solution of borax removes the smell of **fetid perspiration of the feet**.

Internally.—Borax is used as a gargle in **mercurial salivation** and **aphthous sores** of the mouth. Borax tablets slowly dissolved in the mouth reduce **hoarseness**. Borated tincture of myrrh is a valuable local paint for **ulcerated gums**. Glycerin boracis 1 dr., tr. myrrh 10 ms. and water to 1 oz., make a good all-round mouth-wash. Borax is an excellent medicine for **fermentative dyspepsia**, and for dis-infecting foul urine. Its efficacy in **diarrhœa** and **dysentery** is doubtful. To clear putrid ammoniacal urine, boric acid is superior to borax, three or four 15 gr. doses rendering it quite clear. Borax is sometimes employed to increase the labour pains, or to expel the placenta.

Prescribing hints.—The taste is disguised by the syrup of orange peel. The powder may be given in cachets or solution. Borax should not be combined with cocaine or other alkaloids.

ACIDUM CARBOLICUM

Carbolic Acid. C_6H_5OH

Syn. B.P.—Phenol, Phenic Acid, Phenyl Hydrate, Phenyl Alcohol.

Source.—Obtained from coal-tar oil by fractional distillation and purification.

Characters.—Colourless, acicular, deliquescent crystals, becoming pinkish when exposed to moist air; odour tarry; taste sweetish, pungent; melts at $102^\circ F.$; sp. gr. 1.060 to 1.066. **Solubility.**—1 in 30 to 40 of water, freely in glycerin, ether, chloroform, fixed and volatile oils, and alcohol. Does not reddon blue litmus paper immediately; coagulates albumen. **Impurities.**—Aurin or rosalic acid, which gives it a purplish colour when exposed and cresol which gives turbidity to water.

Identification.—By its peculiar odour.

Incompatibles.—Chloral, Ferrous Sulphate.

Action.—Antiseptic, disinfectant, deodorant, local anæsthetic, and caustic.

B.P. Dose.—1 to 3 grs. in pill or mixture.

Enters into.—Inject. Ergot. Hypoderm., Liq. Thyroid., and the

OFFICIAL PREPARATIONS

1. **Acidum Carbolicum Liquefactum.**—Phenol 10, water 1. A colourless liquid becoming pinkish afterwards. **B.P. Dose.**—1 to 3 ms.

2. **Glycerinum Acidi Carbolici.**—1 in 5 by vol.

3. **Suppositoria Acidi Carbolici.**—1 gr. in each.

4. **Trochiscus Acidi Carbolici.**—1 gr. in each. **Dose.**—1 to 3.

5. **Unguentum Acidi Carbolici.**—1 in 25.

NON-OFFICIAL PREPARATIONS AND DERIVATIVES

1. **Carbolic Lotion.**—1 to 2 in 40.

2. **Carbolized Oil.**—1 to 10 or more.

3. **Catheter Oil.**—Phenol 1, Castor Oil 4, Almond Oil 20.

4. **Hypodermic injection.**—2 p.c. solution.

5. **Deep hypodermic injection.**— $\frac{1}{2}$ gr. in 20 ms. of water, in poisoned wounds or erysipelas.

6. **Spray.**—3 grs. to 1 oz.

7. **Inhalation.**—20 grs. in 1 pint.

8. **Antiseptic Carbolic Dressings.**—**Carbolized Wool, Lint Tow.**—5 to 10 p.c. **Ligatures.**—16 p.c. **Carbolic Gauze** (Lister's).—Phenol 1, Resin 4, Paraffin

4. **Carbolic Soap.**—20 p.c.

9. **Pilula Acidi Carbolici.**—Carbolic Acid 60 grs., Hard Paraffin 12 grs., Wheaten Flour 45 grs., Glucanth 3 grs. Divide into 60 pills (*see p. 88*).

10. **Pigmentum Antisepticum.**—Glycerin. Acid. Carbol. 1 oz., Quin. Hydrochloride 30 grs. For application to the nasal passage and pharynx in hay fever.

11. **Carbolized Smelling Salts.**—Carbolic Acid 24, Ammon. Carb. 16, Liq. Ammon. Fort. 44, Ol. Lavend. 1½, Camphor 3, Pine Sawdust *q.s.* In coryza, influenza, or hay fever.

12. **Phenol Camphor.**—Carbolic Acid 1, Camphor 3. As a local anæsthetic for toothache, and as a pigment in diphtheria alone or diluted with almond oil.

13. **Phenol Iodatum.** *Syn.*—*Iodized Phenol.*—Iodine 1, Liquefied Carbolic Acid 4. Caustic and alterative. In endometritis, abrasions, and granular condition of the cervix, ringworm on the scalp and body.

14. **Bromol.** *Syn.*—*Tribromophenol.*—A white, crystalline, insoluble salt prepared by mixing a solution of carbolic acid with bromine water. A powerful antiseptic and caustic. Internally, an intestinal disinfectant in typhoid fever and diarrhoea. *Dose.*— $\frac{1}{2}$ to 2 grs.

15. **Bromo-phenol.** *Syn.*—*Ortho-monobromophenol.*—A violet-coloured liquid. A 2 p.c. ointment in erysipelas.

16. **Chlorphenol.** *Syn.*—*Para-monochlorphenol.*—A powerful antiseptic crystalline salt. Has given brilliant results in erysipelas by the application of an ointment (10 grs. to 1 oz.), and in tubercular ulcerations in the larynx and throat by a 5 to 10 p.c. solution in glycerin.

17. **Acidum Trichlorphenicum.** *Syn.*—*Trichlorphenol.*—Insoluble acicular crystals, forming soluble salts with alkaline bases. Twenty-five times stronger than carbolic acid.

18. **Aseptol.** *Syn.*—*Sulphocarbolic acid, Sulpho-carbol, Sozolic acid, Phenol-sulphonic acid.*—A syrupy soluble liquid, resembling salicylic and carbolic acids in action. A 5 p.c. solution is used in abdominal surgery. A delicate test for albumen and bile in the urine.

19. **Sozal** is an *Aluminium salt of paraphenol sulphonic acid.* Pale, reddish-brown, soluble, antiseptic. *Dose.*—3 to 8 grs.

PHARMACOLOGY

Externally.—Outside the body, carbolic acid arrests the life-processes of the lower organisms, both vegetable and animal, and is a powerful **parasiticide**. It destroys also the properties of **organised ferments**, as yeast, moulds and bacteria, and prevents the zymosis of septic germs, as *anthrax bacilli*. Hence it is an **antizymotic**, and **disinfectant**, though not so powerful as corrosive sublimate. It is said that a 5 p.c. solution kills the plague bacillus. Unorganised or chemical ferments (*enzymes*), such as pepsin, ptyalin, are not so readily affected by it, except in very large doses. As it prevents decomposition, and generation of foul-smelling gases, it is an **antiseptic** and **deodorant**.

Applied to the skin, it causes a temporary burning followed by anæsthesia. Stronger applications act as a caustic, with the formation of a **white eschar** without vesication. Hence, it is a local **irritant**, **anæsthetic** and **escharotic**.

Internally. **Gastro-intestinal canal.**—In a concentrated form, carbolic acid has a similar action on the mucous membrane of the mouth, fauces, œsophagus and stomach, as on the skin. It is a powerful **gastro-intestinal irritant**. It is readily absorbed, and is probably converted into a sulphocarbolate in the stomach. It cannot influence the enzymes unless given in large doses.

Blood and circulation.—It is readily absorbed from the unbroken skin, wounded surfaces, mucous tracts, and subcutaneous tissues. In what form it exists in the plasma is not known, probably as an alkaline carbolate. In moderately large doses, it first stimulates then paralyses the **vaso-motor centre**, thereby first increasing the blood-pressure and pulse-beat, and afterwards diminishing them. Cardiac action is not affected until very large doses are given, when it is depressed.

Respiration.—No effect is seen in small doses, but large doses first stimulate then paralyse the **respiratory centre**.

Temperature. No effect is produced by medicinal doses, but large ones lower it.

Nervous system.—In fairly large doses, it affects the medulla and cerebrum. Its influence on the respiratory, cardiac and vaso-motor centres has already been referred to. It also stimulates the **salivary and sweat centres** producing **salivation and perspiration**. The cells of the anterior cornua are first stimulated then paralysed, the result being convulsions followed by paralysis. Poisonous doses produce headache, giddiness, contracted pupils and finally coma.

Urine.—Carbolic acid is chiefly excreted by the urine, in the form of sulphocarbolates, glycuronic acid, pyrocatechin and hydroquinone. Pyrocatechin being a dark-coloured body, gives it a **dark or olive-green colour**, but this cannot be the sole cause. Sometimes albumen is detected. *In poisoning by the acid, the normal sulphates disappear from the urine.* The urine in these cases resists decomposition for a considerable time.

Elimination.—By the saliva, sweat, respiratory and gastro-intestinal secretions and urine. A portion of it is lost in the body, probably converted into oxalates and carbonates.

Acute toxic action.—If swallowed in a concentrated form, the patient feels intense burning pain in the mouth, fauces, and stomach, with the formation of white eschars in the mouth, &c. He soon becomes collapsed with a cold clammy sweat, subnormal temperature, weak, feeble pulse, and shallow laboured breathing, heart and respiration stopping almost simultaneously. Reflex excitability is lost and convulsions occasionally set in. Urine becomes dark green, and finally the patient becomes insensible and comatose. The *post-mortem* reveals hard, white eschars in the mouth, œsophagus, and stomach, with or without inflammatory redness. Blood dark, and its coagulability diminished.

Antidotes.—Pump, emetics. Soluble sulphates, such as magnesium sulphate 1 oz. or sodium sulphate $\frac{1}{2}$ oz. in 8 ozs. of water at once. If no

time can be spared, sodium sulphate should be injected hypodermically or into the peritonæum, in order to counteract the effect of the poison in the blood, for the soluble sulphates combine readily with the acid. Magnesium sulphate should not be injected. Chalk, saccharated lime, egg-albumen, oils, demulcents, stimulants, hot-water bottles, strychnine hypodermically, &c., are useful adjuvants. Repeated washing of the stomach with glycerin has been found efficacious by Whittla.

Chronic toxic action.—The following symptoms have been observed by the writer in a case where a deep suppurating cavity in a scrotal elephantiasis was plugged with carbolie acid dressings—headache, anorexia, gastro-intestinal disturbance, insomnia, fever, dark urine.

Caution.—Green or smoky urine is often the first warning, but in a doubtful case the urine should be examined to ascertain the presence or absence of ordinary sulphates. The products of carbolie acid in the urine can be detected by distilling the urine, and adding bromine water to the distillate, when white crystalline sulphocarbonate precipitates.

THERAPEUTICS

Externally.—Crude carbolie acid or phenyle is employed to disinfect and remove the foul odours of water-closets, drains, dissecting rooms, hospital-wards, bed-pans, spittoons, &c. A sheet moistened with a solution (1 in 40), and hung at the doorway of a sick-room disinfects the air, but it is doubtful whether it can act as a germicide. For small operations, as for instance puncturing the skin with a hypodermic needle, carbolie acid may be applied to produce local anesthesia. To stimulate **indolent sores**, to prevent the foul smells of **gangrenous ulcers**, to destroy **exuberant granulations**, **condylomas** and the **poison of poisoned wounds**, the application of undiluted carbolie acid is most valuable. A 20 or 40 p.c. solution allays the **itching of urticaria** and **eczema**. Glycerin, Acid. Carbolie, is an effective remedy for **ringworm**, **favus**, and **tinea versicolor**. According to Whittla, a deep hypodermic injection ($\frac{1}{2}$ gr. to 20 ms. of water) has been found useful in **synovitis**, **glandular** and **joint swellings**, **erysipelas**, **poisoned wounds** and deep inflammations. To wash surgeons' hands, instruments, sponges, linen, and the parts to be operated upon, carbolized lotions are daily used in surgical practice. $\frac{1}{2}$ gr. in water 5 ms. removes **piles** when injected. It is doubtful whether its inhalation is of any service in **phthisis**, **gangrene** of the lungs and **chronic bronchitis**. The pain of **anal fissures** and **ulcers** is relieved by the application of liquefied carbolie acid. The application of Phenol Camphor or Iodized Phenol, relieves **excoriation** and **ulceration** of the **os** and **cervix** and **chronic endometritis**. A vaginal douche (1 in 80 or 100) is beneficial in **leucorrhœa**, **uterine ulcers** and **cancer**, but it sometimes causes itching and irritation.

Internally.—A pellet of cotton-wool dipped in melted anhydrous carbolie acid, and put into the cavity of the **carious tooth**, and covered by an extra pellet to protect the soft parts, relieves **toothache**. For **ulcerative** and **aphthous stomatitis**, **follicular tonsillitis** and

diphtheria, a solution (glycerin. acid. carbolic. 15 to 20 ms. in water 1 oz.) makes an excellent gargle. In **hay asthma**, **Pigmentum Antisepticum** is a useful local application to the nares and pharynx. Some physicians use carbolic acid in **malarious** fevers, but the writer doubts its efficacy. As an intestinal antiseptic, carbolic acid has been employed in **enteric fever**, **sloughing dysentery**, **acute and chronic diarrhoea** but with doubtful results.

Prescribing hints.—Best given in pill form. The pills must be coated with keratin or varnished with salol, if intended for action on the intestine. When given in a mixture, it should be well diluted and combined with glycerin and peppermint water.

ACIDUM CHROMICUM

Chromic Anhydride. CrO_3

Source.—Produced by the interaction of sulphuric acid and potassium bichromate.

Characters.—Crimson, acicular, deliquescent crystals. *Solubility*—Freely in water. Decomposed by alcohol.

Action.—Powerfully corrosive, disinfectant, and antiseptic.

OFFICIAL PREPARATION

1. **Liquor Acidi Chromici**,—1 in 4. Caustic.

PHARMACOLOGY

Externally.—It is a powerful **oxidising agent**, destroying the lower organisms, and is therefore a **deodorant** and **disinfectant**. It coagulates albumen and oxidizes organic substances, and therefore acts as a **caustic**.

THERAPEUTICS

Externally.—Liquor Acidi Chromici is used for destroying **warts**, **condylomata**, **lupus**, **cystic goitre**, and other small **cystic tumours**. It should be applied with a pointed glass rod, the adjacent parts being protected by a plaster or ointment, and a piece of wet lint kept ready to absorb any superfluous acid. A lotion (10 grs. to 1 oz.) has a decided good effect on **syphilides**, **psoriasis** and **nodules** on the tongue. **Ranula** and **lingual epithelioma** require the application of a more concentrated solution (1 to 2), which should be washed off after a few minutes with solution of aluminium acetate. A weak lotion (1 in 40 or more) is useful for **ulcerated gums** and **foul sores**; and as an injection (1 in 2000 to 4000) in **gonorrhoea** and **leucorrhoea**. A 3 p.c. solution checks perspiration of the feet.

Chromic acid solution does not burn or stain linen, and is a delicate test for albumen in the urine.

Prescribing hints.—It should not be mixed with glycerin or alcohol as the mixture is likely to explode (*see* p. 109).

ACIDUM CITRICUM. Citric AcidHydrogen Citrate. $C_3H_4 \cdot OH \cdot (COOH)_3, H_2O$ **Source.**—Prepared from the juice of the fruit of various species of *Citrus*.**Characters.**—Colourless, trimetric prisms; taste acid. *Solubility.*—4 in 3 of cold and 2 in 1 of boiling water. *Impurities.*—Copper, lead, iron, calcium, sulphuric and tartaric acids.**Incompatibles.**—Alkaline carbonates, potassium tartrate, and acetates.**Enters into.**—Succus Limonis (17½ grs. in ½ oz.), Syr. Limonis, Sod. Phosph. Effer., Sod. Sulph. Effer., Mag. Sulph. Effer., Lith. Citras Effer., Liq. Ammon. Citratis. All these contain free citric acid.

20 grs. of Citric Acid in 1 oz. of water	} will neutralize {	30 grs. of Pot. Bicarb.
		24 grs. of Sod. Bicarb.
		17 grs. of Ammon. Carb.
		13 grs. Mag. Carb.

Action.—Refrigerant, antiscorbutic.**B.P. Dose.**—5 to 20 grs. in water.**ACIDUM TARTARICUM**Tartaric Acid. $C_4H_6O_6$ **Source.**—Prepared from potassium tartrate.**Characters.**—Colourless, monoclinic prisms; taste acid. *Solubility.*—10 to 8 of water, 1 in 2½ of alcohol (90 p.c.). *Impurities.*—Iron, lead, copper, calcium, tartrate of potassium, oxalic acid, arsenium, &c.**Incompatibles.**—Salts of calcium, potassium, lead, mercury, alkaline carbonates, and vegetable astringents.**Enters into.**—Mag. Sulph. Effer., Sod. Sulph. Effer., Sod. Phosph. Effer., Pulv. Sod. Tart. Effer., Lith. Citras Effer., and Pil. Quin. Sulph.**Dispensing hints.**—Both citric and tartaric acids should be weighed in a dry glass pan, and preserved in a tightly stoppered bottle, otherwise they will deliquesce.

20 grs. of Tartaric Acid in 1 oz. of water	} will neutralize {	27 grs. of Potas. Bicarb.
		22 grs. of Sodium Bicarb.
		15 grs. of Ammon. Carb.

B.P. Dose.—5 to 20 grs.**SUCCUS LIMONIS**Lemon Juice. N. O. *Rutaceæ***Syn. I. V.**—*Nembu-ras*, Beng. *Nembuká árak*, Hind.**Habitat.**—West Indies, Southern Europe, India.**Source.**—Freshly expressed juice of the ripe fruit of *Citrus medica*, var. *β Limonum*.**Characters.**—Slightly turbid, yellowish; sp. gr. 1.030 to 1.040. 1 fl. oz. contains 30 to 40 grs. or on an average 35 grs. of citric acid.

Composition.—Citric acid free and combined, malic acid, phosphoric acid, &c.

110 ms. of the juice are neutralized by $11\frac{1}{2}$ grs. of KHCO_3 , $9\frac{1}{2}$ grs. of NaHCO_3 , and $16\frac{1}{2}$ grs. of Na_2CO_3 .

Action.—Refrigerant, antiscorbutic. *Dose.*—1 to 2 ozs.

Enters into.—The preparation of Citric Acid and the

OFFICIAL PREPARATION

1. **Syrupus Limonis.**—1 in 2. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.

PHARMACOLOGY OF CITRIC ACID, TARTARIC ACID AND LEMON JUICE

Externally.—They have no action on the unbroken skin, but cause irritation and pain when applied to an abraded surface.

Internally. Mouth.—Like all acids, they stimulate the salivary secretion and thereby allay thirst.

Stomach.—Free acids unite with bases to form neutral salts. When given in an effervescing form, the liberated **carbonic acid gas** acts as a **gastric sedative**.

Blood.—The neutral salts formed in the stomach are **deoxidized** in the blood after absorption. For instance, potassium citrate becomes decomposed into potassium carbonate, carbonic acid and water, thus $2(\text{C}_3\text{H}_4\text{O}_7\text{K}) + \text{O}_{18}$ (from blood) = $3(\text{K}_2\text{CO}_3) + 9\text{CO}_2 + 5\text{H}_2\text{O}$, thereby **increasing** the **alkalinity** of the plasma. If these acids are given in large doses, a portion remains unoxidised and thus *diminishes* the alkalinity, and as a consequence thereof, somewhat checks metabolic exchanges between the blood and the tissues.

Urine.—They are excreted as carbonates, except in large doses, when they escape partly unchanged. Hence, in medicinal doses they increase the **alkalinity of the urine**.

THERAPEUTICS OF CITRIC ACID, TARTARIC ACID AND LEMON-JUICE

Internally.—As a refrigerant drink, *e.g.* lemonade, they are given to allay thirst in **fevers**. The sucking of a lemon is refreshing in dryness of the mouth. Carbonic acid—the product of an effervescing mixture—checks **nausea** and **vomiting**. Citrates and tartrates are useful in promoting the absorption of **uric acid** deposits. Lemon-juice and citric acid are specifics for **scurvy** and **scurvy rickets**. Some authors say that the best form for administration in this disease is the sodium citrate and not the potassium salt. Some assert that lime-juice ($\frac{1}{2}$ to 1 pint) is serviceable in **acute rheumatism**. Some think it useful in malarial fevers. In our days, citric and tartaric acids are chiefly used for their remote effects, and for making effervescing draughts and preparations.

Prescribing hints.—For causing the absorption of small uric acid calculi, you should order 40 to 60 grs. of citrate of potash to be dissolved in 4 oz. of water and taken every 4 hours. If more than this is given, an insoluble biurate may form on the surface of the stone.

With some patients you will find it best to give the full dose in a tumbler of water at bedtime, so as to counteract the excessive acidity of the urine passed during the night.

ACIDUM GALLICUM. *See* Galla

ACIDUM HYDROBROMICUM DILUTUM

Diluted Hydrobromic Acid. HBr.

Source.—An aqueous solution containing 10 p.c. by weight of hydrogen bromide, obtained by the distillation of potassium bromide with concentrated phosphoric acid.

Characters.—A colourless, inodorous liquid; taste and reaction acid; sp. gr. 1.077. *Impurities.*—Arsenic, barium, chlorides, phosphates, sulphates, or sulphites.

Dispensing hints.—Should be kept in the dark. Commercial acid becomes coloured by keeping.

Action.—Sedative, hypnotic. **B.P. Dose.**—15 to 60 ms. (60 ms. = 10 grs. of potassium bromide)

NON-OFFICIAL PREPARATION

1. **Acidum Hydrobromicum Concentratum.**—1 in 3 of distilled water makes the official diluted acid.

PHARMACOLOGY AND THERAPEUTICS

Internally.—Diluted hydrobromic acid has the same action as that of the bromides, but is not so reliable. It is chiefly used in combination with quinine to prevent cinchonism, and sometimes, with morphine to prevent its after-effects. It neither gives rise to **acne** nor is it so depressant as bromides. The writer often combines it with quinine, when he administers large doses.

Prescribing hints.—Large doses (2 to 4 drs.) may be given freely diluted or with syrup and water. 2 ms. of the dilute acid should be prescribed for each grain of quinine ordered.

ACIDUM HYDROCHLORICUM

Hydrochloric Acid. HCl.

Syn.—Muratic acid. Spirit of salt.

Source.—Obtained by dissolving in water the gas produced by the interaction of sulphuric acid and sodium chloride, containing 31.79 p.c. of hydrogen chloride by weight.

Characters.—A colourless, strongly acid liquid emitting white fumes; sp. gr. 1.160. **Impurities.**—Sulphurous and sulphuric acids, arsenic, copper, lead, iron, aluminium, bromides, iodides, free chlorine.

Incompatibles.—Lead, silver, and mercurous salts, tartar emetic, alkalis, and their carbonates.

Action.—Powerfully escharotic.

Enters into.—The preparation of Acid. Nitro-hydrochloricum dil., Apomorph. Hydrochlor., Cocaine Hydrochlor., Glyc. Pepsini, Liq. Arsen. Hydrochlor., Liq. Ferri Perchlor. Fort., Liq. Zinc. Chlor., Podophyl. Resin, many chlorides, and the

OFFICIAL PREPARATION

1. **Acidum Hydrochloricum Dilutum.**—Contains 10.58 p.c. of hydrogen chloride. **B.P. Dose.**—5 to 20 ms. diluted.

Enters into.—The preparation of Ext. Ergot., Inj. Apomorph. Hyp., and Liq. Morph. Hydrochlor.

PHARMACOLOGY AND THERAPEUTICS

Internally.—Being the normal acid of the gastric juice, it is given after meals in all cases where dyspeptic symptoms are due to achlorhydria, and before meals in all cases of hyperchlorhydria. It is also employed to reduce the alkalinity of urine in phosphatic deposits, and to stimulate the hepatic action. Zander has claimed for hydrochloric acid an efficacy in the treatment of chlorosis comparable to that of iron, but other observers have not obtained such satisfactory results.

ACIDUM NITRICUM

Nitric Acid. HNO_3

Source.—Prepared by the interaction of sulphuric acid and potassium and sodium nitrate; containing 70 p.c. of hydrogen nitrate.

Characters.—A clear, colourless, acid liquid emitting corrosive fumes; sp. gr. 1.42. **Impurities.**—Lead, copper, iron, arsenic, chlorides, bromates, iodates, sulphates.

Incompatibles.—Alkalis, alcohol, carbonates, oxides, sulphates, lead acetate, ferrous sulphate.

Action.—Powerfully corrosive.

Enters into.—The preparation of Acid. Phosph. Con., Argent. Nitras, Liq. Hydrarg. Nit. Acid., Spt. Æther. Nitros., Ung. Hydrarg. Nit., and the

OFFICIAL PREPARATIONS

1. **Acidum Nitricum Dilutum.**—1 in $5\frac{1}{2}$ or 17.44 p.c. of hydrogen nitrate. **B.P. Dose.**—5 to 20 ms. (5 ms. contain 1 m. of HNO_3).

2. **Acidum Nitro-hydrochloricum Dilutum.**— $\frac{1}{2}$ and 1 in 8 (16 ms. contain $1\frac{1}{2}$ ms. of nitric and 2 ms. of hydrochloric acid). **Composition.**—Free chlorine, hydrochloric, nitric, and nitrous acids. It should be set aside for 14 days before use. **B.P. Dose.**—5 to 20 ms. diluted.

NON-OFFICIAL PREPARATION

1. **Acidum Picricum.** *Syn.*—*Carbazotic Acid.*—Formed by dropping Phenol into fuming Nitric Acid. Yellow, shining laminar or acicular crystals. Cotton-wool, impregnated with a saturated solution of picric acid, has recently been extensively used for burns. The wounds heal readily under the artificial scab formed, but there is danger of toxic absorption, and several cases of peripheral neuritis are on record as the result of this treatment.

PHARMACOLOGY AND THERAPEUTICS

Externally.—Strong nitric acid is often employed to destroy **chancres**, **warts**, **hæmorrhoids**, **phagedænic sores** and the poison of venomous snakes and rabid dogs. Nitro-hydrochloric acid baths (*see* p. 65) are useful in **chronic hepatic congestion**.

Internally.—Both the diluted nitric acid and nitro-hydrochloric acid are **sialagogues**, **gastric tonics** and **hepatic stimulants**, and are largely employed in **dyspepsia**, **torpidity of the liver** and **catarrhal jaundice**. They are sometimes given in **infantile diarrhoea** on account of their feeble astringent property, and in **chronic bronchitis** when the secretion is profuse. Where mercury is not well borne, nitric acid is sometimes given in **syphilis**. It is beneficial in **mercurial** and other forms of **stomatitis**.

ACIDUM PHOSPHORICUM CONCENTRATUM

Concentrated Phosphoric Acid. H_3PO_4

Source.—Prepared by treating, with water and nitric acid, the residue left after burning phosphorus in air, containing 66.3 p.c. of hydrogen orthophosphate.

Characters.—A colourless, *syrupy* liquid; taste and reaction acid; sp. gr. 1.5. **Impurities.**—Lead, copper, arsenic, sulphuric, nitric, hydrochloric, phosphorus, pyro and metaphosphoric acids, silica.

Incompatibles.—Sodium carbonate, calcium salts.

Action.—Caustic.

Enters into.—The preparation of Acid. Hydrobrom. Dil., Ammon. Phosph., Syr. Calcis Lactophosph., Syr. Ferri Phosph., Syr. Ferri Phosph. c. Quin. et Strych., and the

OFFICIAL PREPARATION

1. **Acidum Phosphoricum Dilutum.**—3 in 20, or 13.8 p.c. **B.P. Dose.**—5 to 20 *ms.*

PHARMACOLOGY AND THERAPEUTICS

Internally.—The diluted acid is a **refrigerant** and **gastric tonic**. It does not derange the digestion. It makes an agreeable drink in **diabetes** and **febrile diseases**. By some it is considered serviceable in cases of **phosphatic diathesis**. It is a mistake to ascribe the therapeutic virtues of free phosphorus to the acid.

ACIDUM SULPHURICUMSulphuric Acid. H_2SO_4

Source.—Obtained by the combustion of sulphur or pyrites and the oxidation and hydration of the resulting sulphurous anhydride by means of nitrous and aqueous vapours.

Characters.—A colourless, corrosive, oily, acid liquid, evolving heat when water added. Sp. gr. 1.843. **Impurities.**—Lead, copper, iron, arsenic, selenium, ammonium, carbonaceous matters, and other acids.

Incompatibles.—Alkalis and their carbonates, calcium, and lead salts.

Action.—Powerfully corrosive.

Enters into.—The preparation of many mineral acids, ethers, sulphates, Inf. Rosæ Acidum, and the

OFFICIAL PREPARATIONS

1. **Acidum Sulphuricum Aromaticum.** *Syn.*—*Elixir of Vitriol*.—1 in 14 or 13.8 p.c. of hydrogen sulphate. **B.P. Dose.**—5 to 20 ms.

2. **Acidum Sulphuricum Dilutum.**—1 in 12 nearly. In making this preparation, remember that the acid must be added to the water; not the water to the acid. **B.P. Dose.**—5 to 20 ms.

PHARMACOLOGY AND THERAPEUTICS

Externally.—Concentrated sulphuric acid has a strong affinity for water, charring and desiccating the parts with which it comes in contact. It is therefore a most powerful **caustic**.

Internally.—The concentrated form is a violent irritant and caustic. Freely diluted, it may be given to **allay thirst** in **cholera** and **hæmorrhage**. Being a powerful **gastro-intestinal astringent**, it is successfully employed in **diarrhœa**, **cholera** and **gastro-intestinal hæmorrhage**. It is eliminated by the kidneys and bowels in the form of a sulphate. It prevents the absorption of lead, and for that reason lemonade made with sulphuric acid is largely used by workers in lead as a prophylactic against Plumbism.

In combination with zinc sulphate, it checks the night-sweats of **phthisis**.

GENERAL PHARMACOLOGY OF HYDROCHLORIC, NITRIC, PHOSPHORIC AND SULPHURIC ACIDS

Externally.—All are irritants and corrosives in a concentrated form. Diluted solutions are local astringents and styptics. Still more diluted, they are external refrigerants and anhydrotics. All mineral acids are disinfectants.

Internally. Gastro-intestinal tract.—They stimulate the secretion of the alkaline saliva and thus allay thirst. In the stomach they neutralize free alkali and form neutral salts, which are probably absorbed as such. Given before food, they retard the flow of the acid secretion—gastric juice; and with or after food, they promote that of

the alkaline secretions of the liver, pancreas and intestinal glands. Nitric and nitro-hydrochloric acids act also as powerful **hepatic stimulants** and **cholagogues**. Diluted acids, especially sulphuric, have an **astringent** action on the intestines.

Blood.—They circulate in the blood as neutral salts, and render the blood *less alkaline but never acid*. Hydrochloric acid increases the number of red blood corpuscles in **chlorosis**, but does not affect the hæmoglobin.

Kidneys.—They do not increase the **free acidity of urine** to any appreciable extent. Nitric acid is partly converted into ammonia and tends to increase the alkalinity of urine.

Acute toxic action.—All these acids are **irritant poisons**. If swallowed in a concentrated form, intense burning pains extending from the mouth to the stomach, excoriation, and formation of grey or yellowish eschars in the mouth, severe abdominal pain and tenderness, vomiting of coffee-coloured matters containing dark clots of blood and shreds of mucus, constipation, or if bowels are open, stools dark from the admixture of blood, are the prominent symptoms. Dyspnoea, due to laryngeal swelling either from irritant fumes or from the introduction of some of the acid, is not infrequent. Collapse with cold perspiration soon sets in and the patient dies.

Antidotes.—No pump. Alkalis, such as soda, lime water, soap water, magnesia in a moderately diluted solution at once. Demulcents as egg albumen, bland oils, linseed tea, &c. Morphine subcutaneously to relieve pain; ether, brandy, &c., as stimulants.

Chronic toxic action.—General emaciation, languor, catarrhal inflammation of the gastro-intestinal canal, anorexia, and anæmia are the chief symptoms.

ACIDUM HYDROCYANICUM DILUTUM

Diluted Hydrocyanic Acid. HCN

Syn.—Diluted Hydrogen Cyanide. Prussic Acid.

Source.—An aqueous solution containing 2 p.c. of hydrogen cyanide by weight, prepared by the interaction of diluted sulphuric acid and potassium ferrocyanide; thus,



Characters.—A colourless, volatile liquid with a peculiar odour; sp. gr. 0.997. **Impurities.**—Sulphates and chlorides.

Identification.—Its peculiar almond-like odour helps recognition. Its vapour in large quantities is poisonous.

Incompatibles.—Copper, iron and silver salts, red mercuric oxide and sulphides.

Dispensing hints.—It should be stocked in small, blue, stoppered bottles which are tied over and inverted, in a cool, dark place. If its colour becomes brown it is unfit for use. Extemporaneously it can be prepared, if necessary, by mixing silver cyanide 6, diluted hydrochloric acid B.P. 15, distilled water 45, by shaking and filtering. Product = 2 p.c. of HCN.

Action.—A most rapid, deadly poison. Sedative, antispasmodic.

B.P. Dose.—2 to 6 ms. *Daily dose.*—10 ms.

Enters into.—Tr. Chloroform. et Morph. Co., Aq. Laurocerasi Amygdala Amara and Prunum Virg. also contain it.

NON-OFFICIAL PREPARATIONS

1. **Acidum Hydrocyanicum** (Scheele) **B.P.C.**—Contains 4 p.c. of HCN. *Dose.*—1 to 4 ms.

2. **Vapor Acidi Hydrocyanici** **B.P. 1885.**—10 to 15 ms. in water 1 dr.

PHARMACOLOGY

Externally.—It is a protoplasmic poison. It is absorbed from the epidermis, but more readily from a raw surface. It paralyses the periphery of the sensory nerves, and thus acts as a **local sedative** and **anæsthetic**.

Internally. **Alimentary canal.**—It is also absorbed rapidly by the mucous membrane, and has the same action on the mouth and stomach as on the skin. It is therefore a powerful **gastric sedative**.

Blood.—It quickly enters the blood from all parts of the body. If death is immediate, the **venous blood** is found **bright scarlet**, due possibly either to the arrest of the oxygenation of hæmoglobin, or according to Brunton, to the rapid flow of blood through the dilated peripheral blood-vessels without undergoing the usual changes. But if death is delayed even for a few minutes, the blood becomes **dark purple** owing to the conversion of oxygen into carbonic acid, most probably from asphyxia due to the paralysis of the respiratory centre.

Heart and blood-vessels.—A large dose at once arrests the heart in diastole. This result is due to direct action on the **cardiac centre**, and the nervo-muscular apparatus of the heart, for it has been observed that hydrocyanic acid stops the heart's action even when topically applied. A small dose stimulates the **vagal centre**, and **slows the pulse**. The **blood-pressure** is first momentarily **heightened** and afterwards **deeply lowered** from a transitory stimulation and subsequent paralysis of the **vaso-motor centre**.

Respiration.—As a rule, the **respiratory centre** is paralysed after a brief stimulation. Respiration becomes feeble and laboured and death takes place from asphyxia, except in those cases where the heart is instantly stopped by a large dose.

Brain.—Medicinal doses have no action. Large doses cause **insensibility** and **coma**, referable either to the direct action of the drug on the cerebrum, or to the altered condition of blood from asphyxia. **Pupils are dilated**. Convulsions do not occur in man, but are common in animals.

Medulla and cord.—It is a **paralyser** of the respiratory, cardiac and vaso-motor centres. The reflex excitability of the cord is first lowered and then abolished altogether. The peripheral sensory nerves

are less affected by internal administration, than by local application. The motor nerves and muscles are also paralysed.

Elimination.—Hydrocyanic acid is rapidly excreted, chiefly by the breath. A portion is supposed to be eliminated as formate of ammonia.

Acute toxic action.—If the dose be large, death is instantaneous. But, with a smaller dose, the patient becomes unconscious; his eyes fixed; pupils dilated; pulse feeble, and irregular or imperceptible; respiration slow, deep and convulsive with frothing at the mouth; skin cold and clammy and at last death occurs. At the *post-mortem* are found the odour of hydrocyanic acid, lividity of the surface, clenched fingers, firmly closed jaws, froth at the mouth, fixed and glistening eyes, dilated pupils, dark blood, and slightly congested stomach.

Antidotes.—Emetics or pump if possible. Fresh air, cold and hot affusion alternately to the head, artificial respiration, diffusible stimulants, oxygen and ammonia inhalation, and electricity. Atropine and strychnine hypodermically. Protosalts of iron are chemical antidotes.

THERAPEUTICS

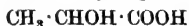
Externally.—Dilute hydrocyanic acid removes the itching of **urticaria**, **lichen** and **dry eczema**, when the affected parts are bathed or sponged with a lotion (2 drs. to 8 ozs. of rose water and glycerin). For the same purpose, an ointment ($\frac{1}{2}$ dr. to 1 oz.) may be used. Care should always be taken not to apply the ointment or lotion to a raw surface.

Internally.—For **irritative gastric disorders** and **dyspepsia** it is ordinarily prescribed with sodium bicarbonate, bismuth and gentian. It allays the **hacking cough** of phthisis, and the spasms of **asthma**, **pertussis** and **hiccough**. It checks palpitation and cardiac distress caused by dyspepsia.

Prescribing hints.—Dilute hydrocyanic acid may be combined with sodium bicarbonate (*see* p. 108) and given either as an effervescing draught or in an almond emulsion.

ACIDUM LACTICUM

Lactic Acid. Hydrogen Lactate



Source.—May be obtained from the fermentation of lactose, containing 75 p.c. of hydrogen lactate.

Characters.—A colourless, syrupy liquid; sp. gr. 1.21. **Solubility.**—Freely in water, alcohol, and ether. **Impurities.**—Mineral and other acids, sugar, lead, &c.

Action.—A solvent of diphtheritic false membranes.

OFFICIAL PREPARATION

1 **Syrupus Calcii Lactophosphatis.**—B.P. Dose.— $\frac{1}{2}$ to 1 dr.

NON-OFFICIAL PREPARATIONS AND DERIVATIVES

1. **Acidum Lacticum Dilutum.** B.P. 1885.—Lactic acid 3 ozs., distilled water to 1 pint. *Dose.*— $\frac{1}{2}$ to 1 dr.
2. **Nebula Acidi Lactici, T.H.**—Lactic Acid 1, Distilled Water 15.
3. **Calci Lactas.**—*Dose.*—1 to 15 grs.
4. **Ferri Lactas.**—*Dose.*—2 to 10 grs.
5. **Syrupus Calcii et Ferri Lactophosphatum.**—*Dose.*— $\frac{1}{4}$ to 1 dr.

PHARMACOLOGY AND THERAPEUTICS

Externally.—The concentrated acid is **corrosive** and is used alone or in the form of a paste with kaolin to destroy **lupus**.

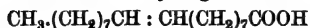
Internally.—A 50 p.c. solution has been successfully applied to **pharyngeal tubercles** after scraping. As a pigment or spray it is occasionally used to dissolve **false diphtheritic membranes**. On the stomach, it acts like hydrochloric acid, and is often given as a **gastric adjuvant in dyspepsia**. It allays thirst in **diabetes** and other diseases. Sour butter-milk may be used as a substitute for the same purpose. It is said to be useful in the **diarrhoea of phthisis** and of **enteric fever**, and in the **green diarrhoea of infants**. It enters the blood as a lactate, and is eliminated in the urine as a carbonate or carbonic acid in solution.

The internal administration of the acid in some cases has given rise to acute pain in the limbs and joints simulating "rheumatism." Sir Walter Foster has recorded a case where the administration of the acid on three separate occasions was followed by acute articular pain, which subsided on the discontinuance of the acid.

Soured milk is of great use in the treatment of diseases of the **large bowel, colitis, chronic dysentery, etc.**, and also in the **summer diarrhoea** of infants. To be free from danger it is absolutely necessary that certain precautions be taken in the preparation of this soured milk. The milk used must first be sterilized to get rid of all contaminating and undesirable organisms. To this sterilized milk some reliable preparation of lactic acid bacilli must be added, e.g. trilactin tablets or liquid trilactin, *Fermen lactyl*, &c.; the vessel containing the milk is then covered and allowed to stand in a warm place, or a thermos flask may be used, or an apparatus consisting of lamp and vessel obtainable from any chemist. After being thus incubated for from six to ten hours the milk is ready for use. From one to three pints may be taken daily. Cream, sugar, etc., may be added if desired, before taking, to render the preparation more palatable.

ACIDUM OLEICUM

Oleic Acid. Hydrogen Oleate



Source.—Obtained by the saponifying action of alkalis and subsequent action of acids, or by the action of superheated steam, upon the olein of fats.

Characters.—A straw-coloured liquid, odour faintly rancid. *Solubility.*—In alcohol (90 p.c.), chloroform, or ether. *Impurities.*—Rarely pure. Palmitic and stearic acids.

Enters into.—The preparation of Oleates of Lead, Mercury, and Zinc, and of Ointments of Aconitine, Atropine, Cocaine, Mercuric Oleate, and Veratrine.

ACTIONS AND USES

Oleic acid penetrates the skin more readily than fixed oils and fats, and is therefore used in pharmacy for compounding ointments containing metallic oxides and alkaloids.

ACIDUM SALICYLICUM

Salicylic Acid. $C_6H_4 \cdot OH \cdot COOH$

Source.—It is of two kinds.—(1) **Natural Salicylic Acid**, prepared from natural salicylates, such as the oil of winter-green (*Gaultheria procumbens*, N.O. *Ericaceæ*), or the oil of sweet birch (*Betula lenta*, N.O. *Betulaceæ*). (2) **Artificial Salicylic Acid** prepared by the interaction of sodium carbolates and carbonic anhydride. *Physiologically pure* artificial salicylic acid is now obtainable.

Characters.—Prismatic, colourless crystals; taste sweetish then acid, leaving a burning sensation in the throat. Light, easily diffused, irritating to the nostrils. *Solubility.*—1 in 500 of cold water and 1 in 15 of hot water, 1 in 3 of alcohol (90 p.c.), 1 in 2 of ether, 1 in 200 of glycerin; also soluble in solutions of ammonium acetate, ammonium citrate, borax, sodium phosphate, alkaline hydroxides, and carbonates. *Impurities.*—Meta-, ortho- and para-cresotic acids, phenol, colouring matter, &c.

Identification.—Salicylic acid resembles strychnine, but the crystals of the latter are larger, non-irritating, less soluble, and make an intensely bitter solution.

Incompatibles.—Iron salts, quinine sulphate, nitric ether and sal volatile.

Action.—Antiseptic, antirheumatic. **B.P. Dose.**—5 to 20 grs.

Enters into.—Inj. Cocain. Hypo., Liq. Atrop. Sulph., Salol, and the

OFFICIAL PREPARATION

1. **Unguentum Acidi Salicylici.**—1 in 50. A local antiseptic.

SODII SALICYLAS

Sodium Salicylate. $(C_6H_4 \cdot OH \cdot COONa)_2 \cdot H_2O$

Source.—Obtained by the interaction of salicylic acid and sodium carbonate or sodium hydroxide. As there are two acids, natural and artificial, so there are two sodium salts, “*natural*” and “*artificial*.”

Characters.—Small, colourless, or white scales or tabular crystals with a pearly lustre; taste sweetish, unpleasant. *Solubility.*—1 in 1 of water, 1 in 6 of alcohol (90 p.c.). *Impurities.*—Carbolates and sulpho-carbolates.

Identification.—Crystals resemble those of Benzoic Acid, but have no aromatic smell.

Incompatibles.—Acids, antipyrine, quinine, and iron salts.

Action.—The same as salicylic acid. **B.P. Dose.**—10 to 30 grs. **M.S. Dose.**—40 grs. **Daily Dose.**—120 grs.

Enters into.—The preparation of Bismuth Salicylas.

NON-OFFICIAL PREPARATIONS AND DERIVATIVES OF SALICYLIC ACID

1. **Effervescent Sodium Salicylate.**—6 grs. in 1 dr. **Dose.**—1 dr.
2. **Ammonii Salicylas.**—**Dose.**—5 to 30 grs.
3. **Calcii Salicylas.** In diarrhœa. **Dose.**—2 to 20 grs.
4. **Potassii Salicylas.** **Dose.**—5 to 30 grs.
5. **Quinine Salicylas** (*see* Quinine).
6. **Strontii Salicylas,** in lithœmia and chronic gout. **Dose.**—3 to 10 grs.
7. **Ferri Salicylas.**—Antiseptic, astringent. **Dose.**—3 to 10 grs.
8. **Collodium Salicylicum.**—Salicylic Acid 30, Ext. of Indian Hemp 5, Flexile Collodion 240. A painless solvent for hard and soft corns.
9. **Inj. Sodii Salicylatis.** **Dose.**—15 to 30 ms.
10. **Glycer. Acidi Salicylici.** *Syn.*—*Salicylic Cream.*—Salicylic Acid 1, Glycerin 9.
11. **Pulvis Salicylicus cum Talco.**—Salicylic Acid 3, Wheat Starch 10, Talc 87. The U.S.N.F. substitutes Boric Acid for wheat flour.
12. **Salicylic Dressings.**—Gauze, Lint, Wool, 4 p.c.
13. **Salicylic and Creosote Plaster Mulls** (Unna).— $\frac{1}{2}$ gr. salicylic acid, 1 gr. creosote in 1 square inch, applied to horny epidermis.
14. **Salumin.** *Syn.*—*Salicylate of Aluminium.*—In reddish powder insoluble in water. Astringent and antiseptic. In ozæna and pharyngeal affections.
15. **Salacetol.** *Syn.*—*Salyl Acetol.*—A compound of salicylic acid and acetol. As an intestinal antiseptic in diarrhœa, in doses of from 30 to 45 grs. in 1 oz. of castor oil before breakfast.
16. **Salicylamide.**—Tasteless, colourless, soluble (1 in 250 of water), crystals, prepared by the action of strong ammonia on methyl salicylate obtainable from the oil of winter-green. A safe and powerful analgesic. **Dose.**—2 to 6 grs.
17. **Agathin.** *Syn.*—*Salicyl - a - methyl - phenyl - hydrazine.*—White or greenish-white crystals insoluble in water. Analgesic and antirheumatic. **Dose.**—5 to 10 grs. thrice daily, to be reduced after 3 or 4 days.
18. **Dithion.** *Syn.*—*Sodii Dithio - Salicylas.*—A greyish or yellowish-white powder soluble in water. A more powerful antirheumatic but free from objectionable sequelæ. **Dose.**—3 grs. thrice daily.
19. **Saliformin.** *Syn.*—*Hexa-methylenc-tetramino-salicylate.*—In white, soluble crystals. A genito-urinary antiseptic and solvent of uric acid. In gout, cystitis, gravel. **Dose.**—15 to 30 grs. daily, freely diluted.
20. **Salophen.** *Syn.*—*Acetyl - para - amido - phenol salicylate.*—Whitish, tasteless crystals, insoluble in water. It is unaffected by gastric juice, but decomposed by the pancreatic secretion. Has a quicker action on acute rheumatism than salicylic acid. **Dose.**—10 to 30 grs. in cachets.

21. **Aspirin.** *Syn.*—*Salicyl-Acetic Acid*.—A valuable substitute for sodium salicylate. Largely used in rheumatism, gout, all neuralgic affections, and diabetes. Particularly useful in migraine and nervous headache. Leaves no bad after-effects, does not cause tinnitus, and does not irritate the mucous membrane of the stomach. *Dose.*—3 to 15 grs. in tablets or suspended in water.

22. **Dymal.** *Didymium Salicylate*.—10 p.c. wool-fat ointment recommended for eczema.

23. **Glycosal.** *Mono-Salicylic Glycerin ester*.—Prevents fermentation in bladder. Recommended in cystitis. *Dose.*—5 to 30 grs.

24. **Rheumatin.** *Syn.*—*Saloguinine Salicylate*.—A white powder slightly soluble in water. Given in acute rheumatism. *Dose.*—15 grs. repeated.

25. **Novaspirin.**—Methyl-citric acid ester of salicylic acid. *Dose.*—15 grs., thrice daily; in influenza, neuralgia, headache.

SALICINUM. Salicin

N. O. *Salicaceæ*. $C_6H_{11}O_6 \cdot O \cdot C_6H_4 \cdot CH_2OH$.

Habitat.—Temperate regions of the Northern Hemisphere.

Source.—A crystalline glucoside obtained from the bark of various species of *Salix* and of *Populus*.

Characters and Tests.—Colourless, shining, trimetric tabular crystals; taste bitter. *Solubility.*—1 in 28 of cold water, 1 in 60 of alcohol (90 p.c.). *Tests.*—Coloured red by H_2SO_4 . Heated with potassium bichromate, a few drops of H_2SO_4 and water yields salicylic aldehyde having the odour of meadow-sweet.

Action.—The same as sodii salicylas. **B.P. Dose.**—5 to 20 grs. *Daily Dose.*—150 grs. in cachets, pills, or mixture.

NON-OFFICIAL DERIVATIVES AND ALLIED PREPARATIONS

1. **Saligenin.** *Syn.*—*Salicylic Alcohol*.—In colourless leaflets soluble in water, obtained either by acting on phenol with formic aldehyde or on salicin with diluted mineral acids. In acute rheumatism and gout. *Dose.*—5 to 10 grs.

2. **Salix Nigra**, or *Black Willow*.—A sexual and uterine sedative, considered useful in hyperæsthesia and pain of ovaritis, seminal emissions, and nymphomania. The liquid extract of bark, root, and buds (1 in 1) is given in $\frac{1}{2}$ to 1 dr. thrice daily.

PHARMACOLOGY OF SALICYLIC ACID AND SALICIN

Externally.—Salicylic acid and salicin are **antiseptics**, but the acid is the most powerful. A 2 p.c. solution of the acid kills bacteria and checks fermentation, but its salts have no antiseptic properties. Salicylic acid is a powerful **local anhydrotic**. Applied to the nose it causes sneezing and cough. It has a special action on the epithelium and in dilute form the acid acts as a **keratoplastic** agent, and aids regeneration of new epithelium. In a concentrated form it acts peculiarly on the epidermis, specially the corneous layer, and the horny

cells are softened, gradually loosened and separated without much inflammatory reaction.

Internally. Alimentary canal.—Salicylic acid is an **irritant** to the stomach, when taken undiluted, causing pain, nausea and vomiting. Sodium salicylate, salicin and aspirin are less irritant. Salicin is a **bitter, stomachic, tonic**. Salicin is transmitted unchanged into the intestine, where it is broken up probably by the help of the pancreatic juice. Salicin is partly converted into **saligenin** and **glucose**, and saligenin again into salicyluric, salicylous and salicylic acids.

Blood.—Salicylic acid enters the blood as a sodium salicylate, which, at any rate, is the form in which it is found in the blood. Some think it exists as an albuminate, but of this there is no proof. There is also no evidence to show that sodium salicylate is converted again into salicylic acid by carbonic acid. However, the fact remains that a portion of the salicylic acid of the salicylate unites with glycocoll either in the blood or tissues to form salicyluric acid; thus $\text{HC}_7\text{H}_5\text{O}_3$ (salicylic acid) + $\text{C}_2\text{H}_5\text{NO}_2$ (glycocoll) = $\text{HC}_9\text{H}_7\text{NO}_4$ (salicyluric acid) + H_2O . This chemical change is identical with what happens in the conversion of benzoic acid into hippuric acid.

Heart and blood-vessels.—Salicylic acid and salicin are said to **depress the heart and lower the blood-pressure**, but salicin does not act so, unless given in toxic doses. Again, the natural salicylic acid is not so depressant as the artificial one, because the latter contains certain impurities, such as **orthocresotic acid** which is a strong **cardiac sedative**. Physiologically pure artificial acid is not a depressant.

Respiration.—Medicinal doses have no action on respiration. Large or toxic doses greatly **depress** it, and may cause death from asphyxia.

Temperature.—The salicylates in moderate doses do not affect the normal temperature but act powerfully as febrifuges, probably by influencing metabolism. They are therefore **antipyretics**. A single dose of 20 to 30 grs. of sodium salicylate may bring down the temperature of 105° F. to 101° F. in 2 or 3 hours.

Skin.—Salicylic acid and sodium salicylate do not increase perspiration in health, but in fevers they produce a copious sweating. Salicin does not cause diaphoresis in moderate doses. The writer has seen a boy twelve years old sweat continuously for two weeks after taking 90 grs. of sodium salicylate in four days. Urticaria and erythema sometimes break out.

Liver.—The salicylates are direct **hepatic stimulants**, sodium salicylate or salicylic acid being most powerful. The secretion of bile is increased, and it is rendered thin and watery. There is, however, a total increase in the solids of the bile. In this respect the action of sodium salicylate resembles that of sodium benzoate.

THERAPEUTICS OF SALICYLIC ACID AND SALICIN 203

Nervous system.—Their action on the nervous system is ill understood. They produce a train of symptoms identical with cinchonism (*see* Salicylism).

Kidneys.—Salicylic acid is excreted in the urine as salicyluric acid and sodium salicylate, which is broken up into salicylic acid by the phosphoric acid in the urine. It can be detected in 10 to 30 minutes in the urine after ingestion, but its excretion is slow. It sometimes causes nephritis with bloody and albuminous urine. Large doses increase the excretion of urea and uric acid, and give sometimes to the urine a greenish colour due to the presence of indican or pyrocatechin. It renders the urine **antiseptic** and **increases its acidity**. It has a gentle stimulating and disinfecting influence on the urinary passages. The urine of the patients taking salicylic acid gives a **purple colour** on the addition of a drop of Tr. Ferri Perchlorid. As aspirin is now frequently given for the treatment of diabetes, it is important to bear this fact in mind when testing the urine of a diabetic patient for di-acetic acid, which gives a somewhat similar colour with Ferric Perchloride. In case of doubt boil the urine and test for acetone.

Uterus.—Some think that salicylic acid is **emmenagogue** and causes **abortion**, but there is no sufficient evidence to confirm this statement.

Elimination.—Salicylates are thrown off chiefly by the urine, and to a less extent by the sweat, saliva, bile, sputum and fæces.

Acute toxic action or Salicylism.—The symptoms are identical with cinchonism. Buzzing in the ears, disturbed vision and headache are the early symptoms. When they appear, the further administration of the drugs is to be suspended. If the drugs are pushed on, nausea, vomiting, involuntary evacuations, deafness, delirium, flushed face, weak and irregular pulse, weak shallow breathing, epistaxis, hæmaturia, albuminuria follow. If still persisted in, death may occur from either cardiac or respiratory paralysis. Charteris has demonstrated that most of the toxic symptoms are referable to the impurities of the synthetic product, probably ortho-cresotic acid. Natural salicylic acid or its salts rarely produce toxic symptoms.

THERAPEUTICS OF SALICYLIC ACID AND SALICIN

Externally.—Salicylic acid is largely employed in surgical practice in the form of a lotion, ointment, lint, cotton, &c. Small **epitheliomas** and **chancres** soon heal, when pure acid is daily dusted over them. In **lupus**, **corns** and **tylosis** Collodium Salicylicum is a useful application. A hot strong solution is recommended in **acne**, and an ointment containing $\frac{1}{2}$ dr. of carbolic and salicylic acids each in 1 oz. cures **ringworm**. Being non-volatile it is not an effective antiseptic for deep suppurating wounds. Pulv. Salicylicus c. Talco is an excellent application for checking **excessive sweating** in phthisis, and **fetid perspiration** of the feet and armpits. A 1 to 4 p.c. solution, or an ointment (1 to 6) often **checks** the itching of **eczema**, **intertrigo** and **urticaria**.

Internally.—Salicylic acid is locally applied to **diphtheritic membranes**. Salicylic acid is used as an internal antiseptic, in **sarcinous vomiting** and **fermentative dyspepsia**.

As an *antirheumatic*, salicylic acid and the salicylates are considered specifics for **acute rheumatism**, possibly by the setting free of salicylic acid in the inflamed part by the carbonic acid in it. They reduce the temperature, lessen the swelling, and relieve the pain, if 20 to 30 grains are given every 2 hours, until 4 to 6 doses are swallowed, and then at longer intervals. Even after an apparent cure they should be continued for one or two weeks. It is said that liability to cardiac complications is minimised by salicylic acid treatment, but many doubt this assertion. Indeed, some authorities aver that the tendency to both endocarditis and pericarditis is greatly increased by the use of salicylates in acute rheumatic fever. In the **hyperpyrexia** of rheumatism, salicylates are of no use. In chronic **rheumatoid arthritis**, **gout**, **gonorrhoeal rheumatism**, opinions differ as to their utility. Where sodium salicylate is contra-indicated, salicin may be given with advantage.

As an *antipyretic*, sodium salicylate and salicin may often be usefully employed in **typhoid**, **remittent**, **intermittent**, **inflammatory** or **specific fevers**. In some chronic **malarial fevers**, salicin and sodium salicylate act better than quinine and arsenic. Sodium salicylate 3 grs. given hourly gives better results in **quinsy** than aconite or guaiacum.

As a *hepatic stimulant*, all these drugs may be given in **torpidity of the liver** and **catarrhal jaundice**, but sodium salicylate is the most effective. Sodium salicylate and aspirin are both useful in the treatment of **hepatic colic**, and are given with benefit as solvents of **gall-stones**.

As an *analgesic*, sodium salicylate may be given in **neuralgias** and **lumbago**, and is considered to be the best remedy for **sciatica**. In chronic **sciatica** it gives the best result when given with iodides.

Sodium salicylate and aspirin have been found to reduce the quantity of sugar of the urine in **diabetes**.

Prescribing hints.—Sodium salicylate is best given in solution. If mixed with ammonia, the mixture gradually turns from **pale-yellow** to **brown** on exposure to air. When given with quinine or citric acid, precipitation occurs (see p. 83).

Caution.—The natural or the physiologically pure artificial salts are alone to be used. They should be given with caution to children, old and weak individuals, and persons suffering from cardiac and renal diseases. The administration of the drugs is to be suspended if headache, deafness and ringing in the ears show themselves.

SALOL. Salol

Phenyl Salicylate. $C_6H_4.OH.COO.C_6H_5$

Source.—By interaction of salicylic acid and phenol, or of their sodium salts, with phosphoryl chloride or carbonyl chloride.

Characters.—Colourless crystals with a faint aromatic odour and little taste. **Solubility.**—Insoluble in water, 1 in 10 of alcohol (90 p.c.), and in fixed and volatile oils. **Impurities.**—Free salicylic acid, sulphates, and chlorides.

Action.—Intestinal antiseptic and analgesic.

B.P. Dose.—5 to 15 grs. in milk or cachets.

NON-OFFICIAL PREPARATIONS AND DERIVATIVES

1. **Collodium Salol.**—Salol 4, Ether 4, Collodion 30. An effective application in acute rheumatism.

2. **Salol cum Camphora.**—Salol 3, Camphor 2. Triturate. A strong antiseptic liquid to check suppuration of the middle ear, and in the treatment of carbuncles.

3. **Ung. Salol c. Cocaina.**—Salol 2, Cocaine Hyd. 1, Petroleum Cerate 16. Mix. In burns.

4. **Salol Tribromide.** *Syn.*—*Cordol.*—A colourless, tasteless powder. A remote astringent and safe hypnotic. *Dose.*—20 to 30 grs.

PHARMACOLOGY AND THERAPEUTICS

Externally.—Mixed with talc, it may be used as an antiseptic dusting powder.

Internally.—It splits up in the intestine into salicylic and carbolic acids. On this account it is apt to cause *Carboluria* and it should therefore never be given in too large doses, or for too long a period continuously, or to persons suffering from renal disease. It has been used in **rheumatic fever**, but possesses no advantages over the other preparations of salicylic acid, and it is certainly more dangerous.

Its chief use is as an **intestinal and urinary antiseptic**. There can be no doubt of its value in bladder surgery, and it is given with advantage both *before* and *after* all operations upon the urinary tract. As an intestinal antiseptic it is falling into disrepute, as many authorities doubt both the possibility and advisability of attempting to sterilize the contents of the intestines. If used for this purpose it should be given in combination with bismuth salicylate and sodium bicarbonate.

ACIDUM SULPHUROSUM.

Sulphurous Acid. H_2SO_3

Source.—An aqueous solution containing 6.4 p.c. of hydrogen sulphite, H_2SO_3 , corresponding to 5 p.c. by weight of SO_2 . The sulphurous anhydride may be prepared by burning sulphur in air or oxygen, or by boiling sulphuric acid with carbon, mercury, or copper.

Characters.—A colourless liquid with a pungent sulphurous odour. Sp. gr. 1.025. **Impurities.**—Sulphuric acid, mineral matters.

Action.—Antiparasitic, antiseptic. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.

OFFICIAL PREPARATION

1. **Sodii Sulphis.**—*See* Sodium Salts.

NON-OFFICIAL PREPARATION

1. **Sodii Hyposulphis.** *Syn.*—*Sodium Thiosulphate.*—As a lotion (1 in 10) for chloasma, ringworm, &c. In flatulent dyspepsia 5 grs., 2 hours after meals. *Dose.*—10 to 60 grs.

PHARMACOLOGY AND THERAPEUTICS

Externally.—Sulphurous acid is a powerful **deoxidizing agent**, a **disinfectant**, a **deodorant** and an **antiseptic**. Sulphurous acid gas is chiefly used for disinfecting infected rooms. Disinfection is best carried on by carefully closing all doors and windows, crevices being pasted over with paper, and sulphur being burnt in the room for at least six hours. Use 2 lbs. of sulphur for every 1000 c. ft. of air space. Also remember to wet the floor, as dry fumes of SO_2 are useless for disinfecting purposes. Metallic substances left in the room should be greased, and coloured fabrics removed, as the gas has bleaching properties. Infected clothes may also be disinfected by sulphur fumes. A lotion (2 drs. to 1 oz.) is said to be efficacious in **ringworm**, **foul ulcers**, and **chloasma**. Sulphur fumigation quickly removes **scabies**, if it is resorted to after a hot-water bath with friction. (*See* p. 70.)

Internally.—As a spray it is of use in **gangrenous stomatitis** and **diphtheritic ulcers**. On the stomach and intestine it produces the same disinfecting and antiseptic effects as on the skin, and is absorbed as a sulphate. It is sometimes given with benefit in **pyrosis** and **fermentative dyspepsia** due to *sarcinae*. Sulphites and hyposulphites may be used for the same purposes as the acid.

ACIDUM TANNICUM. *See* Galla

ACIDUM TARTARICUM. *See* page 189

ACONITI RADIX

Aconite Root. N.O. *Ranunculaceæ*

Syn.—Monk's hood. *Syn. I. V.*—*Kátbish, Dudhia bish*, Hind.

Habitat.—Britain, the Alpine and the Himalayan mountains.

Source.—Dried root of *Aconitum napellus* cultivated in Britain, collected in the autumn.

Characters.—2 to 4 in. long, $\frac{1}{2}$ to $\frac{3}{4}$ in. in diameter at the upper extremity, gradually tapering below; marked with the bases of rootlets and scars and crowned with the remains of an undeveloped bud; dark-brown externally; whitish and starchy internally; no odour; cautiously chewed produces a sensation of tingling and numbness.

Identification.—It resembles *horseradish* (*q.v.*), from which it is distinguished by its brown-black colour, starchy fracture, and the tingling sensation produced in the mouth by chewing.

Composition.—(1) *Aconitine*, the chief active principle. (2) *Benzaconine*. (3) *Aconine*. (4) *Aconitic acid*.

Action.—A powerful poison. A cardiac depressant.

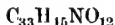
OFFICIAL PREPARATIONS

1. **Linimentum Aconiti.**—1 in 1½. A local anodyne and sedative.
2. **Tinctura Aconiti.**—1 to 20. B.P. Dose.—5 to 15 ms. *Repeated Dose.*—2 to 5 ms.
3. **Aconitina.**—See below.

NON-OFFICIAL PREPARATIONS OF THE ACONITE ROOT

1. **Chloroformum Aconiti. B.P.C.**—Root 20 ozs., Strong Ammonia Solution 1½ ozs., Water 20 ozs., Chloroform *q.s.* Macerate with ammonia and water for 4 hours. Dry and powder. Macerate for 24 hours with chloroform 20 ozs. in a percolator, and percolate slowly to 30 ozs. Mixes with oils and liniments. A powerful sedative in neuralgia, &c.
2. **Linimentum Aconiti Comp. A.B.C. Liniment.**—Aconite, Belladonna, and Chloroform liniments in equal parts.

ACONTINA. Aconitine



Source and Characters.—A colourless alkaloid obtained from aconite root. **Solubility.**—Readily in chloroform and alcohol (90 p.c.), less readily in ether, nearly insoluble in water.

Action.—A virulent poison. Should never be used internally.

OFFICIAL PREPARATION

1. **Unguentum Aconitinæ.**—1 in 50. Action is the same as that of the liniment. A very expensive preparation, on which account its use is limited.

NON-OFFICIAL PREPARATION

1. **Oleatum Aconitinæ.**—Aconitine 2 grs., Oleic Acid 98 grs. Dissolve. A mild local sedative.

PHARMACOLOGY

Externally.—When applied to the skin or mucous membrane, aconite first stimulates then paralyzes the terminations of the sensory nerves, thereby causing tingling, numbness and anaesthesia.

Internally. Gastro-intestinal tract.—In medicinal doses, well diluted, aconite produces no tingling or numbness in the mouth. In large doses, it causes gastro-intestinal irritation, such as nausea, vomiting, diarrhoea, &c. Aconitine is readily absorbed, and can increase salivary and intestinal secretions.

Heart.—In minute doses (1 m. of the Tr.) it slows and steadies the pulse, but in larger doses paralyzes the heart, reducing the force, volume and frequency of the pulse. In still larger doses the cardiac beat becomes feeble, irregular and accelerated, stopping at last in diastole. This is due to its action either on the vagal roots or on the muscular fibres of the heart. The blood-pressure falls chiefly from the paralysis of the heart, and to some extent from that of the vaso-motor centre.

Respiration.—After a brief stimulation respiration becomes **slow, deep, irregular and laboured** owing partly to the **paralysis of the respiratory centre**, and partly to the depressed condition of the circulation and to the irritant effect on the motor centres.

Temperature.—A febrile temperature is **lowered** by aconite ; this effect is produced partly by its depressant action upon the heart and the respiratory centre, partly by increased diaphoresis, and partly by diminished metabolism.

Nervous system.—Whether applied locally or taken internally, aconite first **stimulates** and then **depresses the periphery of the sensory nerves**. The brain remains unaffected. The **pupils** first contract, then dilate. Large doses first stimulate and then depress the motor centres in the spinal cord, causing clonic convulsions followed by muscular weakness and the abolition of the spinal reflexes.

Skin.—Perspiration is **increased**. The mode of action is not known. It sometimes gives rise to an erythematous rash.

Kidneys.—Aconite acts as a mild **diuretic**. The mode of **elimination** is unknown.

Acute toxic action.—Within a few minutes after swallowing a poisonous dose of aconite, severe tingling and burning followed by numbness are noticed in the mouth and gullet. Intense abdominal burning ; vomiting, cold, clammy or profuse sweating ; tingling, formication, and numbness of the skin ; small, feeble, irregular pulse ; fixed, staring eyes with dilated pupils ; difficult respiration ; muscular weakness ; prostration ; fainting, sometimes convulsions ; and, lastly, death either from asphyxia or occasionally from syncope—are the symptoms of poisoning by this drug. Consciousness remains clear, more or less, till death.

Antidotes.—Emetics, pump, stimulants, hot bottles, friction, sinapisms to the heart. Digitalin, strychnine, and atropine are its physiological antidotes. Amyl nitrite inhalation is recommended by Murrell.

Physiological antagonists.—Digitalis, strychnine, atropine, ammonia, ether, and alcohol.

The action of remaining alkaloids is very peculiar as will be seen from the following :—

Benzaconine.—It is bitter and less toxic and does not cause tingling. Its action is entirely antagonistic to that of aconitine. It slows the pulse beat, the ventricles contracting once for every two or three auricular contractions. It interferes with the motor nerves and does not paralyse the sensory nerves.

Aconine, though bitter, does not cause numbness or salivation. It strengthens the ventricular systole and opposes inco-ordination of the heart-beat which aconitine causes. In large doses it depresses respiration and motor nerves.

THERAPEUTICS

Externally.—Aconite in the form of a liniment or ointment is applied for the relief of pain in **neuralgia, sciatica, muscular rheumatism**

and **inflammatory joint affections**. The addition of chloroform increases its efficacy, as it facilitates absorption. For this reason, Chloroformum Aconiti, B.P.C. or the A.B.C. liniment is more effective than the B.P. preparation.

Internally.—Aconite is not so largely used now in fevers as formerly. Nowadays its use is confined chiefly to **inflammatory fevers**, such as pneumonia, pleurisy, peritonitis, pericarditis, erysipelas, acute rheumatism, gout, gonorrhoea, otitis, urethral fever, tonsillitis, sore throat, &c. In many of these cases it should be given in small doses (1 or 2 ms. of the tincture) rather frequently until there is a fall of temperature, sweating and relief of the symptoms. It should never be given in **continued fevers**, such as typhus, typhoid and low remittents. It may be used with advantage in cases of palpitation of nervous origin, as well as in that due to cardiac hypertrophy or aneurism. It is an excellent remedy for re-establishing arrested menstruation. A few drops of the tincture given at bedtime have a quieting effect on the restlessness of many neurotic patients. As a local gastric sedative, it has been prescribed for the **vomiting of pregnancy**.

Caution.—Old persons, or those who suffer from cardiac weakness and respiratory disorders, should not be treated with this powerful remedy. Children and plethoric subjects bear it well.

Prescribing hints.—If aconitine ointment is ordered, a small bit of the size of a bean is to be rubbed in with the tip of the finger over the painful part; care being taken that it does not come in contact with an abraded and mucous surface. If applied over the temples, see that it does not get into the eyes. The best method of administration is to order the tincture in 1 m. doses every 15 or 30 minutes until the pulse begins to be affected, then gradually to increase the intervals according to the needs of the patient; this is safer than commencing with the full B.P. dose.

ADEPS. Lard.

Syn. I. V.—*Suīrke charbi*, Hind.

Source.—The purified fat of the hog, *Sus scrofa*.

Characters.—A soft, white, neutral, fatty substance, melting at 100° F. *Impurities.*—Starch, common salt.

Composition.—(1) *Olein*. (2) *Stearin*. (3) *Palmitin*.

Enters into.—Emp. Canthar., Pil. Phosph., and eight ointments, and the

OFFICIAL PREPARATIONS

1. **Adeps Benzoatus.**—1 in 33. *Enters into.*—Twelve ointments.

2. **Adeps Induratus** is the ordinary lard from which a portion of the oil has been removed by pressure. For use in India and the Colonies where high temperature renders the ordinary lard too soft.

ADEPS LANÆ. Wool Fat

Source.—The purified cholesterol fat of sheep's wool, obtained by heat and pressure.

Characters.—Yellowish, tenacious, unctuous, inodorous. *Solubility.*—In chloroform, ether, partially in alcohol (90 p.c.).

OFFICIAL PREPARATION

1. **Adeps Lanæ Hydrosus.** *Syn.*—*Lanoline.* *Enters into.*—Ung. Comm and Ung. Hamamelidis.

ACTIONS AND USES

Lard and wool fat are largely employed in pharmacy for making certain ointments. They are **emollients**. *Adeps lanæ* is a non-irritant and is readily absorbed, and is therefore used as a basis for the ointment of many active drugs. Benzoated lard does not turn rancid but it is rarely used now.

ADRENALIN. See **Organotherapy****ADHATODA.** *Adhatoda*

N.O. *Acanthaceæ* (*Ind. and Col. Addendum*)

Syn. I. V.—*Bákas*, Beng. *Arushá*, Hind. *Adulsá*, Bom.

Habitat.—India, Eastern Colonies.

Source.—The fresh and the dried leaves of *Adhatoda vasica* (*Justicia adhatoda*).

Characters.—Fresh leaves 5 to 6 in. long, $1\frac{1}{2}$ in. broad, lanceolate entire, taper-pointed, smooth. Dried leaves dark-green. Their odour is tea-like and their taste bitter.

Composition.—(1) *Vasicine*, a crystalline alkaloid. (2) *An Organic Acid* (adhatodic acid). (3) *Ammonia*.

OFFICIAL PREPARATIONS

1. **Extractum Adhatodæ Liquidum.**—Dried powder 10 ozs., Alcohol (60 p.c.) q.s. to produce 1 pint by percolation and evaporation. **B.P.** **Dose.**—20 to 60 ms.

2. **Succus Adhatodæ.**—Freshly expressed and strained. **B.P. Dose.**—1 to 4 drs.

3. **Tinctura Adhatodæ.**—Dried powder $2\frac{1}{2}$ ozs., Alcohol (60 p.c.) q.s. to produce 1 pint by percolation. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.

NON-OFFICIAL PREPARATIONS

1. **Adhatoda Cigarettes.**—In asthma.

2. **Decoctum Adhatodæ.**—Powdered leaves 4 ozs., water 1 pint; boil for 10 minutes. **Dose.**—1 to 2 ozs.

3. **Syrupus Adhatodæ.**—Can be prepared like *Syrupus Hemodesmi*, or by adding liquid extract to the syrup. **Dose.**—1 to 2 drs.

PHARMACOLOGY AND THERAPEUTICS

Externally.—The leaves possess **insecticide** properties, and are therefore considered to be a valuable remedy for blight on tea and other crops. Dr. Watt suggests its use as a **germicide** for drinking-water.

Internally.—Both the leaves and roots are stimulant **expectorants** and **bronchial antispasmodics**. The roots may be used as a substitute for senega. Adhatoda is an excellent remedy for **chronic bronchitis**, **phthisis** and **bronchial asthma**. The decoction of the root bark is frequently used by the natives of this country in catarrh, mild fever and bronchitis. The writer considers it useful in mild forms of **pertussis**, especially if it is complicated with bronchitis. The leaves smoked in the form of a cheroot relieve **asthma**, as they evolve ammoniacal vapour when burnt.

ÆTHER. Ether

Ethyl Oxide. $(C_2H_5)_2O$

Syn.—Ethylic Ether. Sulphuric Ether.

Source.—From ethylic alcohol by interaction with sulphuric acid, containing 92 p.c. of ethyl oxide by volume.

Characters.—A colourless, volatile, inflammable liquid; odour strong, characteristic; sp. gr. 0.735. **Solubility.**—Freely in alcohol (90 p.c.), chloroform, fixed and volatile oils. **Impurities.**—Water, alcohol, free acid, oil of wine.

Identification.—Resembles chloroform, from which it differs by its characteristic odour and inflammability.

Action.—Diffusible stimulant, local and general anæsthetic.

B.P. Dose.—10 to 30 ms. for repeated, and 40 to 60 ms. for single administration.

Enters into.—Collod. Flexile, Tr. Lob. Æther., and the

OFFICIAL PREPARATIONS

1. **Æther Purificatus.**—Ether from which water and ethylic alcohol are removed by washing and distillation. Sp. gr. 0.720.

2. **Spiritus Ætheris.**—1 in 3. **B.P. Dose.**—20 to 40 ms. for repeated use, 60 to 90 ms. for a single dose. **Enters into.**—Tr. Lobel. Æther.

3. **Spiritus Ætheris Compositus.** **Syn.**—*Hoffmann's Anodyne*.—1 in 3 nearly. **B.P. Dose.**—The same as that of Spiritus Ætheris.

NON-OFFICIAL PREPARATIONS

1. **Æther. Methylatus.**—Prepared from methylated alcohol. Sp. gr. 0.717. Suitable for local anæsthesia and inhalation.

2. **Spiritus Ætheris Muricatus.** **Syn.**—*Salis Dulcis. Clutton's Febrifuge Spirits.*—Used in febrile affections. **Dose.**—30 to 60 ms.

PHARMACOLOGY OF ETHER

The action of ether is identical with that of chloroform.

Externally.—Being extremely volatile, ether freezes and paralyses the peripheral ends of the sensory nerves of the part to which it is applied, and is therefore a **local refrigerant** and **anæsthetic**. These local actions are best obtained when it is used as a spray. If the freezing is continued too long, the part may die. If means be taken to prevent evaporation, it acts as **rubefacient** and **vesicant**.

Internally. **Mouth.**—It produces a burning, disagreeable, characteristic taste in the mouth, and reflexly stimulates **salivary secretion**.

Stomach and intestine.—It is quickly absorbed, and stimulates the blood-vessels, nerves and muscular fibres of the stomach, thereby increasing the secretion of the gastric juice and expelling gas. It is therefore a gastric **stimulant** and **carminative**. It reflexly stimulates the bowels, heart and lungs. It is an **intestinal antispasmodic** and appears to excite the action of the liver and pancreas.

Heart and lungs.—Upon the heart and lungs it acts both as a reflex and direct stimulant, raising the blood-pressure and improving the tone and frequency of the pulse and respiration. It is therefore a **good cardiac stimulant**.

Nervous system.—Ether acts on the nervous system in the following order.—1st the cerebrum, 2ndly the sensory spinal centres, 3rdly the motor spinal centres, 4thly the sensory centres in the medulla, and 5thly the motor centres in the medulla. When inhaled, ether produces general anæsthesia, in which respect it resembles chloroform. There are, however, certain marked differences between the two drugs. These are tabulated below:—

Ether

1. Ether should be used in a concentrated form; 70 p.c. of ether and 30 p.c. of air.

2. Ether being inflammable, no fire should be brought close to the mouth.

3. A large quantity is needed to produce anæsthesia (Whitla used in one case 1½ pints).

4. The smell of ether is disagreeable.

5. With ether, the stage of stimulation is very much protracted, consequently there is more struggling.

6. The stage of anæsthesia is shorter, and the degree of anæsthesia is less profound.

Chloroform

Chloroform must be given well diluted; 95 to 97 p.c. of air and 5 to 3 p.c. of chloroform.

Chloroform is not inflammable.

A small quantity, say 3 drs. to 1 oz., is enough.

The smell of chloroform is not disagreeable.

With chloroform, the stage of stimulation is shorter, and therefore less struggling.

The stage of anæsthesia is more complete, and the degree more profound.

7. The fall of temperature is great (Dr. Hare observed 4-4° F. in man).

8. More bronchial than gastric irritation.

9. Cardiac, respiratory, and vaso-motor centres are not readily paralysed; hence ether is a *safer* anæsthetic.

10. Lung complications such as bronchitis, pneumonia are frequent.

11. Elimination is very slow, consequently the smell hangs about the body for a long period.

12. Death from syncope during inhalation is less probable in subjects of cardiac weakness.

The fall of temperature is slight.

Less bronchial but more gastric irritation.

Cardiac, respiratory and vaso-motor centres are readily paralysed, hence chloroform is *not* so safe an anæsthetic.

Lung complications are uncommon.

Elimination is rapid, consequently the smell does not hang about so long.

Death from syncope is more probable in subjects of cardiac weakness.

THERAPEUTICS OF ETHER

Externally.—In the form of a spray, ether relieves the intense pain of **neuralgia** and of superficial minor **surgical operations**. For the latter purpose, the part must be frozen for the time being. As this anæsthesia does not extend into the deeper tissues, ether is not a suitable local anæsthetic for deep surgical operations. Subsequent tingling and smarting are also a drawback. In like manner, the lightning pains of locomotor ataxy, and choreic and tetanic spasms may be relieved.

Internally. **Stomach and intestine.**—Like alcohol and chloroform, it may be given in some forms of **dyspepsia** to expel gas and relieve gastrodynia and cramps. It also benefits those forms of dyspepsia which are caused by defective pancreatic secretion. It improves the taste and helps the assimilation of cod-liver oil when combined with it. Hoffmann's Anodyne is excellent for the relief of **intestinal and biliary colic**. Durande's mixture of ether and turpentine is said to act as a **biliary lithontriptic** in gall-stones.

Heart and lungs.—It is an excellent cardiac and respiratory stimulant, whether given by the mouth or hypodermically (10 to 40 ms.), in **syncope**, **palpitation** or **cardiac failure** from any cause; but its action being transient, it has to be repeated. In full doses it relieves pain and distress in **angina**, **spasmodic bronchitis** and **asthma**. Sometimes it may be given with advantage to improve the tone and allay the irritability of the heart in **delirium tremens**.

Nervous system.—For its antispasmodic properties, it is occasionally given in **hysterical and epileptic threatenings**.

General anæsthesia.—To produce complete insensibility, pure ether must be inhaled. The mode of inhalation and the necessary precautions are almost the same as those for chloroform inhalation (which see). Inhalation is commenced by pouring an ounce of ether on to a sponge in an inhaler, and this is renewed as often as may be necessary and till the anæsthesia is induced. The effect is more rapid if the sponge is wrung out of hot water. Either pure

ether, A.C.F. mixture (alcohol absolute 1, chloroform 2, ether 3), or E_2C_1 (ether 2, chloroform 1) may be continued, if the anæsthesia requires to be kept up for a long time. The administration of a few whiffs of nitrous oxide gas in the beginning makes it much pleasanter for the patient. Dr. Buxton recommends inhalation of ether with oxygen in certain cases, where the induction presents difficulties from spasm, cough, holding of the breath, struggling with cyanosis, in alcoholics and in persons of weak vitality. Hewitt and Blumfeld have recently strongly advocated the administration of a mixture of ether 3 parts and chloroform 2 parts by volume, by the open method (Skinner's mask), to the exclusion of all other methods on account of its alleged safety and freedom from after-effects.

Caution.—The inhalation of ether is contra-indicated in those operations upon the mouth which require the use of artificial light or the cautery. Ether is not a suitable anæsthetic for children, on account of its pungent vapour and its tendency to cause bronchial irritation. For the same reasons it is unsuitable for any laryngeal or tracheal operation.

ÆTHERIS NITROSI SPIRITUS

Spirit of Nitrous Ether

Syn. B.P.—Sweet Spirit of Nitro.

Source.—Obtained by distilling a mixture of alcohol (90 p.c.), nitric and sulphuric acids and copper; containing ethyl nitrite ($2\frac{1}{2}$ p.c.).

Characters.—A limpid, faintly yellow, inflammable liquid; odour penetrating apple-like; taste characteristic; sp. gr. 0.838 to 0.842.
Impurities.—Excess of acid and deficiency of ethyl nitrite.

Composition.—Ethyl nitrite, aldehyde, acetic ether, acetic acid, &c.

Identification.—Its peculiar apple-like odour helps recognition.

Incompatibles.—Potassium and other soluble iodides, iron sulphate, antipyrin, salicylates, tannic and gallic acids, tincture of guaiacum, and emulsions.

Dispensing hints.—It should be kept in small hermetically sealed bottles in the dark. The addition of a few crystals of potassium bicarbonate to the liquid keeps it neutral. It can be extemporaneously prepared by mixing **Nitrosyl** (a concentrated form of nitrous ether) 1, with alcohol (90 p.c.) 19.

Action.—Diaphoretic, diuretic, antispasmodic.

B.P. Dose.—20 to 40 ms. for repeated use, and 60 to 90 ms. for a single dose.

PHARMACOLOGY

Externally.—It causes a slight local anæsthesia by evaporation when applied to skin.

Internally.—It possesses the combined properties of ether and nitrites which it contains, but in a milder degree. It is therefore a mild diffusible stimulant, antispasmodic and carminative,

Heart, blood and blood-vessels.—It diminishes the oxygenating power of the red blood corpuscles. It **accelerates the cardiac activity** and **relaxes the peripheral blood-vessels**, but not to such an extent as the nitrites. It lowers the arterial tension like amyl nitrite, and according to Prof. Leech its effect on the circulation is more persistent than that of amyl or other nitrites. By dilating the renal and cutaneous vessels, it acts as a **diuretic** and **diaphoretic** respectively. Its **antipyretic** property is no doubt due to diaphoresis and changes in the blood corpuscles.

Elimination.—It is excreted by the kidneys and the lungs.

THERAPEUTICS

Internally.—Spirit of nitrous ether forms one of the chief ingredients of a fever mixture, and is used in **catarrhal, intermittent, remittent, typhoid** and other febrile diseases. It is said to be specially serviceable in **fevers during dentition**. As a **diuretic**, it is an excellent remedy for **Bright's disease** after the acute inflammatory stage is passed. Dropsies of renal origin are reduced by its use, but it does little good in those of the cardiac type. It may be employed in **angina pectoris**, and to relieve the cardiac distress of the **dilated heart**, due to chronic **nephritis**, but nitrites do this better.

ETHYL NITRITIS LIQUOR

Solution of Ethyl Nitrite

Source.—A mixture of 95 parts of absolute alcohol with 5 parts of glycerin by volume, containing when freshly made 3 p.c., and when long kept not less than 2½ p.c. by weight of ethyl nitrite; which is obtained by the interaction of alcohol (90 p.c.), sodium nitrite, and diluted sulphuric acid at a low temperature.

Characters.—A limpid, colourless, inflammable liquid; odour and taste apple-like; sp. gr. 0.823 to 0.826. *Impurities.*—Acid, aldehyde, less ethyl nitrite.

Dispensing hints.—Should be stored in small bottles.

B.P. Dose.—20 to 60 ms.

PHARMACOLOGY AND THERAPEUTICS

Its actions and uses are like those of amyl nitrite (which see) but less rapid and more persistent. Liqr. Ethyl Nitrite is a more trustworthy preparation than Spt. *Ætheris Nitrosi* and is therefore introduced into the B.P.

ETHER ACETICUS

Acetic Ether. $\text{CH}_3\text{COO}(\text{C}_2\text{H}_5)$

Source.—Prepared by distilling a mixture of ethylic alcohol, sulphuric acid, and dried sodium acetate. The distillate is then digested with potassium carbonate and purified by redistillation.

Characters.—A colourless liquid with a fragrant odour; sp. gr. 0.900 to 0.905. **Solubility.**—1 in 10 of water, freely in alcohol (90 p.c.) and ether.

B.P. Dose.—20 to 40 ms. for repeated use, and 60 to 90 ms. for a single dose.

Enters into.—Liquor Epispasticus for dissolving cantharidine.

PHARMACOLOGY AND THERAPEUTICS

Internally.—Its action to a great extent resembles that of Sp. Ether. Co. but has a more agreeable taste and odour. It is a **stimulant, carminative** and **antispasmodic**. Its inhalation (30 ms. in water 1 pint) allays laryngeal irritation.

AGROPYRUM. Couch Grass

N.O. *Graminaceæ* (*Ind. and Col. Addendum*)

Syn. B.P.—Triticum.

Habitat.—Australasian, Eastern and North American Colonies.

Source.—The dried rhizome of *Agropyrum repens* (*Triticum repens*).

Characters.—Pale yellow $\frac{1}{8}$ to $\frac{1}{4}$ in. in diameter; usually in sections $\frac{1}{2}$ to $\frac{1}{4}$ in. long. Furrowed longitudinally, hollow except at the nodes. No odour. Taste faint sweetish.

OFFICIAL PREPARATIONS

1. **Decoctum Agropyri.**—1 in 20. **B.P. Dose.**— $\frac{1}{2}$ to 2 ozs.

2. **Extractum Agropyri Liquidum.**—Couch Grass 20 ozs., Alcohol (90 p.c.) and Water q.s. By digestion and evaporation to 1 pint. **B.P. Dose.**—1 to 2 drs.

PHARMACOLOGY AND THERAPEUTICS

Internally.—It is a **demulcent** and **diuretic**, being largely employed in **cystitis** and **irritation of the urinary passages**. The decoction well diluted may be employed as a diluent. Only the fresh rhizome possesses these properties, the dried one is inert.

AJOWAN OLEUM. Ajowan Oil

N.O. *Umbelliferæ*. (*Ind. and Col. Addendum*)

Syn. B.P.—Ptychotis Oil. **Syn. I. V.**—*Jowancer tel*, Beng. *Ajowan ke tel*, Hind.

Habitat.—India, Eastern Colonies.

Source.—The oil distilled from the fruit of *Carum copticum*.

Characters.—Colourless, odour and taste of the thyme; sp. gr. 0.917 to 0.930. If cooled to 32° F. should yield 30 to 36 p.c. of crystalline *Thymol*. known in the Indian bazaars as *ajowan ke full*, and prepared in Central India.

Action.—Stimulant, antispasmodic, carminative, and antiseptic.

B.P. Dose.— $\frac{1}{4}$ to 3 ms.

PHARMACOLOGY AND THERAPEUTICS

Externally.—The actions and uses of the oil resemble those of thymol (which see). It is a capital medicine for disguising the nauseous taste of drugs and correcting the griping of purgatives.

Internally.—**Omum water** or *Ajowan ke arak* distilled from the fruits is a valuable **carminative** and **antispasmodic** in **colic** and **flatulent dyspepsia**.

Ajowan is often chewed with *pan*, or taken with salt for indigestion.

ALCOHOL ABSOLUTUM

Absolute Alcohol

Source.—Ethyl hydroxide, C_2H_5OH , with 1 p.c. of water by weight. Obtained by the removal of water from less strong ethylic alcohol and subsequent distillation.

Characters.—A colourless, volatile, hygroscopic liquid; sp. gr. 0.794 to 0.7969.

Action.—A powerful caustic, possessing a strong affinity for water; but is never used as such.

Enters into.—The preparation of Chloroform and Liq. Sod. Ethyl.

SPIRITUS RECTIFICATUS

Rectified Spirit. S. V. R.

Source.—A liquid containing 90 p.c. by volume of ethyl hydroxide and 10 p.c. of water; obtained by the distillation of fermented saccharine liquids. This contains 1.35 p.c. by volume more of ethyl hydroxide than S.V.R. of B.P. 1885.

Characters.—A transparent, colourless, mobile, inflammable liquid; odour characteristic, pleasant; taste spirituous, burning; sp. gr. 0.8340.

Identification.—Its characteristic smell helps diagnosis. It should not be mistaken for other spirituous substances.

Dispensing hints.—There is a contraction of volume and rise of temperature on mixing it with water. The cooled liquid should be used.

OFFICIAL DILUTED ALCOHOLS

1. **Alcohol 70 p.c.**—To 100 fl. ozs. of alcohol (90 p.c.) add 31 fl. ozs. of distilled water. Sp. gr. 0.8900.

2. **Alcohol 60 p.c.**—To 100 fl. ozs. of alcohol (90 p.c.) add 53½ fl. ozs. of distilled water. Sp. gr. 0.9135.

3. **Alcohol 45 p.c.**—To 100 fl. ozs. of alcohol (90 p.c.) add 105½ fl. ozs. of distilled water. Sp. gr. 0.9436.

4. **Alcohol 20 p.c.**—To 100 fl. ozs. of alcohol (90 p.c.) add 355½ fl. ozs. of distilled water. Sp. gr. 0.9760.

NON-OFFICIAL DILUTED ALCOHOLS

1. **Spiritus Tenuior. Proof Spirit.**—When the sp. gr. of alcohol is 0.920, it is called **proof spirit**. If lighter than this it is said to be “above” and if heavier than this it is called “under proof.”

2. **Spiritus Methylatus.** *Methylated Spirit.*—An impure alcohol containing about 10 p.c. of wood naphtha and $\frac{1}{4}$ p.c. of petroleum oil, which render it too nauseous for drinking. It is cheap because it is duty-free. Liniments and tincture of iodine (for external use) are sometimes prepared with this for the sake of economy.

SPIRITUS VINI GALLICI

Brandy

Source.—Distilled from wine and matured by age, containing $36\frac{1}{2}$ p.c. by weight or $43\frac{1}{2}$ p.c. by volume of ethyl hydroxide.

OFFICIAL PREPARATION

1. **Mistura Spiritus Vini Gallici.** *Syn.*—*Brandy Mixture.* *Egg flip.*—**B.P. Dose.**—1 to 2 ozs.

VINUM AURANTII

Orange Wine

Source.—Prepared by fermenting a saccharine solution to which the fresh peel of bitter orange is added. Contains 10 to 12 p.c. by volume of ethyl hydroxide.

Enters into.—The preparation of Vin. Ferri Citratis and Vin. Quininae.

NON-OFFICIAL PREPARATION

1. **Vinum Aurantii Detannatum, B.P.C.**—Orange wine 1 gal., gelatin $\frac{1}{4}$ oz. Decant after 14 days' maceration.

VINUM XERICUM

Sherry

Source.—A Spanish wine containing not less than 16 p.c. by volume of ethyl hydroxide.

Characters.—Pale yellowish brown. *Impurities.*—Salicylic acid.

Enters into.—The preparation of Vin. Antim., Vin. Colch., Vin. Ferri and Vin. Ipecac.

NON-OFFICIAL PREPARATION

1. **Vinum Xericum Detannatum, B.P.C.**—Sherry 1 gal., gelatin $\frac{1}{4}$ oz. Decant after 14 days' maceration. Both the detannated wines are suitable solvents for iron and alkaloidal salts.

The following is the list of wines showing the amount of absolute alcohol by weight :—

Spiritus Frumenti (Whisky) 51 to 59 p.c.

Spiritus Vini Gallici (Brandy) 36.5 p.c.

Rum, Gin, and Strong Liqueurs about 51 to 59 p.c.

Sherry, Port, Madeira, about 16 to 22 p.c.

Champagne about 10 to 13 p.c.

Hocks, Burgundy, about 9 to 13 p.c.

Spiritus Vini Rubri (Port) 14 to 16 p.c.

Claret 8 to 12 p.c.

Ale and Porter about 3 to 5 or more p.c.

Cider 5 to 9 p.c.

Koumiss and Ginger Beer 1 to 3 p.c.

PHARMACOLOGY OF ALCOHOL

Externally.—Alcohol is an **antiseptic**, superior to glycerin but inferior to chloroform and ether. When allowed to evaporate after application to the skin, it abstracts heat, constricts superficial blood-vessels, arrests perspiration and depresses the local sensory nerves, and thus acts as a **local refrigerant, vascular astringent, anhydrotic and anæsthetic**. On the contrary, if means be taken to check evaporation, or if it be rubbed in, it abstracts water from the skin and renders it drier and harder. After absorption, it stimulates the blood-vessels and nerves, producing redness, heat and pain, and thus acts as a **local stimulant and rubefacient**. It coagulates the albumen of the tissues, but the coagulum is quickly redissolved.

Internally. **Mouth.**—Undiluted alcohol has the same action on the mouth as on the skin, causing a sort of whitish opaque pellicle from the coagulation of the albumen. This is soon dissolved by the tissue fluids. It **reflexly excites salivary secretion and cardiac action**.

Stomach.—On reaching the stomach, undiluted alcohol causes pain, burning and a feeling of warmth. In small doses and diluted, it stimulates both the peristaltic action and the secretions and absorptive power of the stomach. As a result of these actions, appetite is sharpened, digestion is promoted, and gas, if generated, is expelled, hence it is a **gastric stimulant and carminative**. By depressing the gastric nerves, it may relieve pain. When mixed with the contents of the stomach it splits up into **aldehyde and acetic acid**, and precipitates a portion of pepsin, peptones and proteids, but not to such an extent as to impair the digestive process. In large and repeated doses it irritates the mucous membrane, increases the secretion of mucus and retards the secretion of gastric juice. If this irritation is allowed to continue, the gastric follicles atrophy and dyspepsia becomes permanent, as is seen in the case of confirmed drunkards.

A moderate dose of strong alcohol, *e.g.* whisky or brandy, on reaching the stomach, at once **reflexly stimulates** the heart, dilates the blood-vessels of the body, especially those of the skin, and increases the functional activity of the organs; hence it is a powerful **diffusible stimulant**. This action is continued after absorption into the circulation.

Intestine.—It has a slight **astringent** effect on the intestinal mucous membrane.

Blood.—It enters the blood either unchanged or as an aldehyde more readily through the veins than the lacteals. It **binds the oxygen of the oxyhæmoglobin so firmly**, that the latter cannot

take up nor give off oxygen readily, and thus lessens the oxidizing power of the red blood corpuscles and the oxidation in the tissues. As a result of this, there is an imperfect combustion of carbohydrates, and fat is necessarily deposited in the tissues producing **obesity**, as is often seen in habitual drinkers of extra "pegs." It first increases then reduces the amœboid movements of white corpuscles.

Circulation.—The reflex effects of alcohol on the circulation have already been noted. After absorption, its action is more marked on the heart and circulation. The pulse becomes fuller and stronger, and beats quicker, due no doubt to the increased cardiac activity, and dilatation of the peripheral arteries, from its influence on the **cardiac and vaso-dilator centres**. Hence the **blood-pressure rises**. As a result of this activity, the mind becomes exhilarated, muscular power increased, more urine is passed and the skin perspires more freely. This stimulant action does not last long, and is soon followed by **depression**, which is rather persistent. It is therefore a mistake to suppose that alcohol can help a person to perform more bodily work without fatigue.

Respiration.—Alcohol first stimulates and afterwards slows respiration, either by affecting the respiratory or vaso-motor centres.

Temperature.—Alcohol is a mild **antipyretic**, due to (a) the dilatation of the cutaneous blood-vessels, thereby producing increased perspiration and radiation, (b) the diminished oxidation in the tissues, and (c) the general depression caused by excessive doses.

Muscular system.—At first, the muscular strength is increased through the increased circulation in the nervous system. In larger doses inco-ordinate movements are produced. In toxic doses, muscular action is entirely suspended.

Nervous system.—In moderate doses, the action of alcohol on the nervous system is one of **stimulation**, due to (a) the increased cardiac activity, (b) the vascular stimulation, and (c) to its direct influence on the nerve-cells. In large doses, the stimulation is more pronounced though brief, and soon gives place to depression. In its progressive action, either of stimulation or depression it follows the "**law of dissolution**" already described in page 157. In other words, the stimulation and subsequent depression proceed from the highest functions of the brain, in a descending scale, to the lowest ones of animal life. Thus, during the stage of stimulation, the imagination becomes brighter, feelings elevated, intellect clearer (highest functions of the brain), senses more acute, bodily activity more predominant and some of the lower appetites sharpened. The depression follows in the same order, i.e. the judgment fails while the imagination, emotions and power of speech are still excited, then the imagination and will power give way. The patient talks, laughs, sings or cries without restraint, but gradually he loses control over these functions too, his speech becomes thick, incoherent and at last suspended. His muscles next get affected, at first the delicate movements, such as

writing, playing on the piano, &c., are abolished, then the other movements become inco-ordinate and paralysed. The **reflex centres** in the cord are now involved, he passes stools and urine involuntarily, and finally the **respiratory and cardiac centres** become paralysed, and the patient dies.

Skin.—Alcohol is a mild **diaphoretic** due partly to the dilatation of the cutaneous blood-vessels and partly to its influence on the sweat-glands. But if it is taken in larger doses, this dilatation of blood-vessels may proceed to such an extent, that death may follow from excessive radiation of heat, though the drinker may feel a sense of temporary warmth in the beginning, if his cutaneous vessels were contracted previously from cold air.

Kidneys.—Alcohol acts also as a mild **diuretic**, from the dilatation of the renal vessels. A portion of it is excreted in the urine unchanged, if large quantities are taken. Gin has a greater diuretic effect than other spirits.

Elimination.—By far the greater part of alcohol is oxidized as carbonic acid and water: less than 3 p.c. of it is thrown off unoxidized chiefly by the lungs, less by the kidneys and least by the skin.

Acute toxic action.—A large quantity may cause sudden death either by reflexly arresting the heart's action, or after a short time, by paralysing the respiratory and cardiac centres. Symptoms preceding death are generally unconsciousness, fixed, contracted, or dilated pupils, weak pulse, cold clammy skin, stertorous breathing, and occasionally delirium or convulsions.

Antidotes.—Emetics or stomach pump. If the patient cannot swallow, coffee with ammonia may be injected by the pump after the stomach has been washed out. Sinapisms, cold affusion, electricity, amyl nitrite inhalation, strychnine $\frac{1}{16}$ gr. to $\frac{1}{8}$ gr. subcutaneously, may be used.

Chronic toxic action or "Alcoholism" is induced by prolonged alcoholic indulgence. Insomnia, muscular tremor, and gastric disturbance are the early symptoms. Gastritis, peripheral, or multiple neuritis, cirrhosis of the liver causing ascites, chronic interstitial nephritis causing anasarca, dilatation of the heart, gout, nervous disorders, such as delirium tremens, epilepsy, paralysis, insanity, &c., are the diseases which afflict confirmed drunkards. Generally they are thin, but a few, especially those who drink beer, get fat. They cannot withstand well any serious illness, such as pneumonia, and are particularly liable to attacks of phthisis. Gin drinkers mostly suffer from cirrhosis of the kidneys and liver.

THERAPEUTICS OF ALCOHOL

Externally.—A continuous local application of a spirituous lotion with a piece of lint or rag, allowing free evaporation,

- (a) relieves some forms of **headache** ;
- (b) subdues **acute inflammation** ;
- (c) prevents the setting in of or allays **local inflammation**, as in sprains, bruises and boils ;

(d) hardens the skin and obviates **threatening bed-sores and cracked nipples.**

Sponging with alcohol and water often relieves the itching of **erythema, urticaria, &c.** Eau-de-Cologne or brandy is often rubbed into the body to check sweating and bring back warmth to the surface, as in **collapse and syncope.** Liniments containing alcohol are rubbed into the skin,

(a) to aid the absorption of inflammatory products, as in **chronic rheumatism, stiff joints ;**

(b) to give nutrition to tissues, as in **paralysis ;**

(c) to counter-irritate, as in **catarrh, bronchitis, pneumonia, pleurisy, &c. ;** and

(d) to relieve pain, as in **myalgia and chronic rheumatism.**

Internally. **Mouth.**—As a local astringent, anodyne and antiseptic, it is used in many mouth and throat diseases. Undiluted brandy held in the mouth relieves **toothache** and the pain of **follicular tonsillitis.** The latter disease is also benefited by its astringent and antiseptic properties. Port wine is sometimes used as a **gargle** in **mercurial salivation, sore throat** and **inflamed and spongy gums.**

Stomach.—As a digestive stimulant, alcohol may be given in small doses just before or during meals in the following class of cases :—

1. Convalescents from acute illness with weakened appetite and digestion.

2. Patients suffering from chronic wasting diseases.

3. Town-dwellers leading a sedentary life.

4. Old and overworked persons.

In **painful dyspepsia, vomiting of pregnancy** and **flatulence,** champagne or brandy with soda-water is sometimes useful. A good peg of whisky or brandy with hot water often relieves **gastric spasms.** **Fainting, syncope or threatening collapse** may be averted by a single large dose of brandy or whisky by reflexly stimulating the circulation. **Diarrhoea or cholera** in the beginning may be checked by a stiff dose of brandy.

Heart.—As a cardiac stimulant, the effects of alcohol are more persistent than those of ether and ammonia. Hence brandy or whisky is an excellent remedy for threatening **cardiac failure** due to shock, hæmorrhage, febrile and other diseases. In small regularly continued doses, it relieves the distress of **cardiac dilatation** in cases of failing compensation.

Nervous system.—Alcohol must be used with great caution in depressed conditions of the nervous system lest a bad habit be induced. Many nervous diseases do not require any alcohol. In some cases of **insomnia, hysteria and neuralgia,** alcohol no doubt affords temporary relief, but it must, if possible, be avoided for fear of generating intemperance. As to the use of alcohol in **acute alcoholism (delirium**

tremens), opinions differ. Its use is only justifiable where the stomach cannot retain food, and then in small doses as a sustainer of life.

Kidneys.—Gin is a powerful diuretic, because it contains juniper which is also a diuretic. As alcohol is eliminated by the kidneys, and is an irritant to the mucous membrane of the urethra, it should be avoided in gonorrhoea, gleet, &c.

Skin.—Alcohol is rarely used as a diaphoretic, except in cases of catarrh or febrile diseases.

Fevers.—Opinions are at variance as to the efficacy of alcohol in fevers. Some consider it an essential element in their treatment, while others think it injurious. The following are the indications for its use:—

- (1) To strengthen and reduce the frequency of a soft and frequent pulse ;
- (2) To diminish the frequency of respiration ;
- (3) To moisten a dry tongue ;
- (4) To lessen delirium and to produce sleep ;
- (5) To reduce high temperature ;
- (6) To aid digestion ; and
- (7) To sustain the heart and nervous system.

If it fulfils these objects it is doing good ; if it does not, then its use should be discontinued.

Many cases of fevers do well without alcohol. Experience alone will guide the practitioner when and where to use wines.

Prescribing hints.—It must be borne in mind while ordering alcoholic beverages, that the effects produced are modified by various circumstances such as (a) the amount of volatile ethers they contain ; this is of more importance than the actual alcoholic strength ; (b) the degree of their dilution with water ; (c) the age, toleration and habits as regards alcoholic drinks of the patient ; (d) the amount of exercise taken by him ; (e) the condition of his stomach, whether empty or full ; (f) the condition of his excretory organs, especially the kidneys ; and (g) the nature of the diseases for which they are given.

In many exhausting febrile or other diseases, patients can consume without intoxication a large amount of alcohol, even as much as one pint of brandy per diem. Sparkling wines (carbonic acid) facilitate absorption and produce a quicker action. Old brandy, whisky or port should be preferred as they contain less injurious ingredients. Different varieties of wines should not be given at the same time, as they derange digestion. Small quantities in repeated doses with some easily digestible food are the best method of administration. Debilitated persons do well if an alcoholic drink is given an hour before food. Champagne, port, strong claret or beer may produce burning and aching of the rectum, and new and inferior brandy or whisky headache, because the latter contains fusel oil, furfural and many injurious aldehydes.

For continuous use $1\frac{1}{2}$ ozs. of pure alcohol is all that can be utilized as a food in the human body daily. Roughly $1\frac{1}{2}$ ozs. of pure alcohol equals 3 ozs. of whisky or brandy, which is equal to $1\frac{1}{2}$ pgs, or is equivalent to 7 ozs. of sherry, 15 ozs. of champagne, claret or white wine.

ALOE BARBADENSIS

Barbados Aloes. N.O. *Liliaceæ*

Syn. I. V.—*Musabár*, Beng. Hind.

Habitat.—West Indian Islands.

Source.—The dried inspissated juice from the transversely cut leaves of *Aloe vera*, *Aloe chinensis*, and other species. Known in commerce as *Barbados* and *Curacao Aloes*.

Characters.—In yellowish or reddish-brown or almost black hard masses. Fracture either dull and waxy, with opaque splinters; or smooth and glassy, with transparent splinters. Odour disagreeable. Taste nauseous and bitter. *Solubility.*—Almost entirely in alcohol (45 p.c.) and (75 p.c.), in cold water. *Impurities.*—Natal aloes.

Identification.—The general appearance, colour, and odour help recognition, especially the last, which is characteristic, and can be distinctly perceived when the drug is breathed upon. It may be mistaken for *Guaiacum resin*, which has a greenish tint and no smell; *Salap resin*, which has a sweetish odour and acid taste.

Composition.—(1) *Aloin* (Barbaloin). (2) *Emodin*, or trioxymethyl-anthraquinone. (3) *Resin*. (4) *Volatile oil*. *Gallie acid* a trace.

Action.—A simple purgative. **B.P. Dose.**—2 to 5 grs.

Enters into.—Pil. Cambog. Co., Pil. Colocynth. Co., Pil. Colocynth. et Hyoseyam., and the preparation of Aloinum, and the

OFFICIAL PREPARATIONS

1. **Decoctum Aloes Compositum.**—B.P. Dose.— $\frac{1}{2}$ to 2 ozs.
2. **Extractum Aloes Barbadosis.**—B.P. Dose.—1 to 4 grs.
3. **Pilula Aloes Barbadosis.**—B.P. Dose.—4 to 8 grs.
4. **Pilula Aloes et Ferri.**—B.P. Dose.—4 to 8 grs.
5. **Tinctura Aloes.**—B.P. Dose.— $\frac{1}{2}$ to 1 dr. for repeated use, and $1\frac{1}{2}$ to 2 drs. for a single dose.

ALOE SOCOTRINA

Socotrine Aloes. N.O. *Liliaceæ*

Habitat.—Socotra and Zanzibar shipped via Bombay.

Source.—Dried juice from the transversely cut leaves of *Aloe Perigi* and probably other species of Aloes. Both the Socotrine and Zanzibar aloes are official.

Characters.—*Socotrine Aloes.*—Viscid, brownish-yellow, or dark-brown or nearly black, hard masses when dry. Fracture dull waxy, uneven. Odour strong, not disagreeable. Taste nauseous, bitter. *Zanzibar Aloes.*—In liver-brown masses; fracture dull, waxy, nearly smooth, even; odour

characteristic; taste nauseous, bitter. Both varieties are opaque even in small splinters. *Solubility of both varieties.*—Almost entirely in alcohol (45 p.c.) and 1 in 2 of water. *Impurities.*—Barbados and Natal aloes.

Identification.—It is recognised as aloes by the general characters. From Barbados aloes it is distinguished by its *fruity and agreeable odour*. The colour of the powder of the two varieties also differs materially. The distinction between guaiacum and jalap resins has been adverted to.

Composition.—The same as that of Barbados aloes.

Action.—A simple purgative. **B.P. Dose.**—2 to 5 grs.

Enters into.—Pil. Rhei Co., Tr. Benzoin. Co., and the preparation of Aloinum, and the

OFFICIAL PREPARATIONS

1. **Pilula Aloes Socotrinæ.**—B.P. Dose.—4 to 8 grs.
2. **Pilula Aloes et Asafetidæ.**—B.P. Dose.—4 to 8 grs.
3. **Pilula Aloes et Myrrhæ.**—B.P. Dose.—4 to 8 grs.

NON-OFFICIAL PREPARATIONS

1. **Extractum Aloes Socotrinæ.** B.P. 1885.—Dose.—1 to 6 grs.
2. **Tinctura Aloes Co.** Syn.—*Elixir ad longum vitum*.

ALOINUM

Aloin. $C_{16}H_{16}O_7, 3H_2O$

Source.—A crystalline neutral principle extracted from Barbados and Socotrine Aloes. The formula given above is that of Aloin extracted from Barbados aloes.

Aloin is named according to the variety of aloes from which it is extracted, **Barbaloin, Soccoloin, Nataloin, &c.**

Characters.—Tufts of yellow acicular crystals; inodorous; taste of aloes. *Solubility.*—Freely in hot water, nearly insoluble in cold.

Action.—Cathartic. **B.P. Dose.**— $\frac{1}{2}$ to 2 grs. in pill.

NON-OFFICIAL PREPARATION

1. **Pilula Aloini Co.**—Aloin, Ex. Nucis Vom., Ferri Sulph., Myrrh, Soap each gr. $\frac{1}{4}$. Given half an hour before the last meal.

PHARMACOLOGY

Externally.—The activity of aloes is due to its active principle aloin. On the unbroken skin it has no action, but is absorbed from a denuded surface which it stimulates. If sprinkled over an ulcer, it causes purging.

Internally. **Gastro-intestinal canal.**—In minute doses, aloes acts on the stomach as a **stomachic, bitter tonic**. Its action is not so marked on the small intestine, beyond slightly increasing the flow of bile, but it powerfully stimulates the muscular fibres of the colon, and slightly increases its glandular secretion. Therefore, it is a **cathartic**, but its action is slow, taking 10 to 20 hours to purge. Large doses do

not necessarily act earlier, but operate more violently and are accompanied by pain, griping, tenesmus and even bleeding from the rectum. In moderate doses the stools are soft, dark-coloured and formed, and in large doses they are liquid. The slowness of its action is believed to be due to the fact that aloin cannot produce catharsis unless it is decomposed in the intestine into a more potent product by admixture with bile. Soap or alkalis combined with it help its solution, and to a certain extent prevent griping. The griping is caused by the irregular contractions of the colon. It increases the vascularity of the rectum, therefore the constant use of aloes may cause hemorrhoids. When given as an enema, it kills thread-worms.

Liver.—According to Rohrig and Rutherford, aloes increases the secretion of bile and is therefore a direct **hepatic stimulant**.

Uterus.—By stimulating the pelvic circulation, aloes acts as an **emmenagogue** (*see* p. 164). Sometimes it leads to menorrhagia. The writer once treated a case of violent menorrhagia caused by the habitual use of aloes. It may cause abortion.

Elimination.—Aloes is excreted in large quantities with the milk, for suckling babies are purged when it is given to their mothers. It is also eliminated to a slight extent with the urine.

Aloin causes less griping. Barbados aloes is slightly stronger than the other varieties.

THERAPEUTICS

Externally.—The Indian bazaar aloes (*musabar*) with turmeric or opium made into a paste is considered by the natives of India as an effective remedy for contusions and swellings, but it remains to be proved how far it is beneficial in this respect.

Internally. Gastro-intestinal tract.—Aloes is reckoned as a **valuable purgative** in **chronic** and **habitual constipation**, for (1) it does not cause after-constipation, (2) gains instead of loses its activity by repetition, (3) improves rather than deranges digestion, (4) stimulates the secretion of bile, and (5) improves the tone of the colon. Aloes is ordinarily given in the form of a pill with rhubarb, nux vomica, ipecacuanha or colocynth. Its griping property is corrected by carminatives and extract of belladonna or hyoscyamus. In minute doses it relieves piles, and in large doses aggravates them. Compound decoction of aloes is a useful preparation for the constipation of children with hard faeces, worms and derangement of digestion, but is unreliable at times. According to Whitla, it may be used to check obstinate **diarrhoea** in adults and children. An enema of aloes may be used as an **anthelmintic**.

Female diseases.—Aloes is given with success in **amenorrhoea** and delayed menstruation, especially when associated with dyspepsia and chronic constipation. For this purpose we use Pil. Aloes et Myrrhae. When given with iron as Pil. Aloes et Ferri, it is very serviceable in **anæmia**, **chlorosis** and **amenorrhoea** of young girls.

Caution.—Aloes is contra-indicated in pregnancy; irritable conditions of the pelvic organs, especially rectum, hæmorrhoids, menorrhagia, and during the nursing period of mothers.

Prescribing hints.—Aloes is ordinarily given in the form of a pill. Aloin gr. 4, Strychnine Sulph. gr. $\frac{1}{4}$, Pulv. Ipecac. gr. 6, Ext. Belladonna gr. $1\frac{1}{2}$. M. Divide into 20 pills. One pill daily in habitual constipation after dinner. Extract of liquorice disguises its nauseous taste.

ALSTONIA. *Alstonia*

N.O. *Apocynaceæ*. (*Ind. and Col. Addendum.*)

Syn.—Dita Bark.

Syn. I. V.—*Sapta parna*, Sans. *Chátim*, Beng. *Chátán*, *Satni*, Hind.

Habitat.—India, Australasian and Eastern Colonies.

Source.—The dried barks of *Alstonia scholaris* and of *Alstonia constricta*.

Characters.—The bark of *Alstonia scholaris*.—In fragments, $\frac{1}{4}$ to $\frac{1}{2}$ in. thick, spongy, brownish-grey outside, bright buff within; no odour; taste bitter. The bark of *Alstonia constricta*.—In curved pieces or quills $2\frac{1}{2}$ in. wide, $\frac{1}{2}$ in. thick. Periderm thick, rusty-brown, rugose, reticulated. Internally cinnamon-brown with longitudinal striæ. Odour faint-aromatic. Taste very bitter.

Composition.—The bark contains many alkaloids, the chief being *ditaïn* from the *dita* bark (*A. scholaris*) and *Alstonine* from the bark of *A. constricta*.

OFFICIAL PREPARATIONS

1. **Infusum Alstoniæ.**—1 in 20, $\frac{1}{2}$ hour. **B.P. Dose.**— $\frac{1}{2}$ to 1 oz.
2. **Tinctura Alstoniæ.**—Powder bark $2\frac{1}{2}$ ozs., Alcohol (60 p.c.) 1 pint. By maceration. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.

PHARMACOLOGY AND THERAPEUTICS

Externally.—The milky juice of the plant, or its fresh leaves roasted and made into a poultice, applied to foul ulcers, stimulates them and removes maggots if present.

Internally.—The bark is an astringent, tonic, antiperiodic and anthelmintic, being considered very useful in chronic diarrhoea, advanced stages of dysentery and catarrhal fever. Ditaïn paralyses the motor-nerve endings in mammals, and has been found successful in the treatment of malarial fevers. Dr. Sharp recently used the bark of *A. constricta* in certain conditions of typhoid fever and influenza after its febrile stage; and considers it to be an excellent tonic possessing the combined properties of quinine and strychnine.

ALUMEN. Alum

Potassium Alum— $\text{Al}_2(\text{SO}_4)_3, \text{K}_2\text{SO}_4, 24\text{H}_2\text{O}$

Ammonium Alum— $\text{Al}_2(\text{SO}_4)_3, (\text{NH}_4)_2\text{SO}_4, 24\text{H}_2\text{O}$

Syn. I. V.—*Falkiri*, Beng. *Filkári*, Hind.

Source.—Prepared by combining aluminium sulphate with potassium sulphate or with ammonium sulphate.

Characters.—Colourless transparent regular octahedral crystals. Taste sweetish, astringent. *Solubility.*—1 in 10 of cold and 1 in 3 of boiling water, freely in glycerin, insoluble in alcohol (90 p.c.). *Impurities.*—Silicates and iron sulphate.

Identification.—Crystals of alum are distinguished by their characteristic shape, exhibiting octahedral facets, the powder is identified by its peculiar sweetish astringent taste.

Incompatibles.—Lime, alkalis, salts of lead, mercury, iron, tartaric acid, tartrates, and tannic acid.

Action.—Astringent, emetic. **B.P. Dose.**—5 to 10 grs.

OFFICIAL PREPARATION

1. **Glycerinum Aluminis.**—1 in 6. By trituration and gentle heat, if necessary. A local astringent.

ALUMEN EXSICCATUM

Exsiccated Alum

Source.—Prepared by heating potassium alum till aqueous vapour ceases to be disengaged, and the salt loses 45 to 46 p.c. of its weight.

Characters.—A white soluble powder absorbing moisture on exposure to air.

NON-OFFICIAL PREPARATIONS AND ALLIED DERIVATIVES

1. **Lapis Divinus.** *Syn.*—*Blue Wound Stone.*—Alum, Copper Sulph. Potassium Nitrate, of each 1 oz. Fuse and, when molten, add Camphor $\frac{1}{2}$ dr. Mix and cast into sticks.

2. **Lapis Miraculosus.** *Syn.*—*Yellow Wound Stone.*—Alum 16, Ferri Sulph. 24, Copper Sulph. 16, Ammon. Chlorid. 1, Verdigris 2. Mix and fuse.

3. **Liq. Aluminium Acetici, G.P.**— $7\frac{1}{2}$ to 8 p.c. of aluminium subacetate. An antiseptic mouth lotion (1 in 8). **Aluminium Acetotartrate** is a better preparation for making lotion.

4. **Aluminii Chloridum.**—A white amorphous, deliquescent powder. Relieves the pain of *locomotor ataxy*. *Dose.*—2 to 4 grs. Its solution (impure) is known as **Chloralum**, a disinfectant.

5. **Alumnol.** *Syn.*—*Aluminium salt of Naphthol-sulphonic Acid.*—A whitish soluble powder. A $\frac{1}{2}$ to 2 p.c. lotion is useful in *ozæna*, *pharyngitis*, *gonorrhœa*, *leucorrhœa*. A 20 p.c. solution is caustic.

6. **Sozal.**—See page 185.

7. **Salumin.**—See p. 200.

8. **Ferri Aluminas.**—See Ferrium.

9. **Alsol.**—Aceto-tartrate of aluminium. $\frac{1}{4}$ to $\frac{1}{2}$ p.c. solution useful a compress in *trachoma*, *scrofulous ophthalmia*.

PHARMACOLOGY

Externally.—Alum has no action on the unbroken skin, but coagulates the albumen of discharges and tissues. It therefore forms a covering

on ulcers and sores, constricts blood-vessels and arrests bleeding. Hence, it is a valuable **local astringent** and **hæmostatic**. Dried alum is a mild **caustic** because it abstracts water.

Internally. **Mouth and throat.**—Alum is a local **astringent** to the mouth and throat, imparting an astringent taste, and a feeling of dryness to the throat.

Stomach and intestine.—In small doses (4 to 8 grs.) it has the same astringent action on the stomach and intestine as on the raw skin, producing **constipation**. Its **hæmostatic action** is now believed to be entirely local, having little effect on remote hæmorrhages. In 30 to 60 grs. it causes **vomiting** by directly stimulating the peripheral nerves of the stomach, and in still larger doses it is a **gastro-intestinal irritant** causing vomiting and purging. When injected per rectum, it kills **thread-worms**.

Elimination.—Alum is probably absorbed into the blood as an albuminate, and has no remote action on the tissues in medicinal doses. It is chiefly eliminated with the feces and partly by the skin and kidneys.

Acute toxic action.—Poisoning by alum is rare. When it occurs, the symptoms are those of gastro-intestinal irritation—vomiting, purging, &c.

Antidotes.—Emetics or pump. Small doses of sodium carbonate in tepid water decompose alum.

Chronic toxic action.—Anorexia, constipation, gastro-intestinal catarrh are the prominent symptoms.

THERAPEUTICS

Externally. **Skin.**—Being cheap and easily available, alum is used in various minor complaints. In powder or in a concentrated solution, it stops bleeding from **leech bites**, **wounds**, and **superficial cuts**. Exsiccated alum destroys weak exuberant **granulations**. A weak solution of alum and borax (1 p.c. of each) checks the discharge of a **weeping eczema**.

Nose.—Its solution makes a useful **collunarium** in **ozæna**. Powdered alum either sniffed up or blown in by means of a paper funnel, or its lotion (10 grs. in 1 oz.) injected into the nostrils, arrests **epistaxis**.

Eyes.—Alum makes a useful **collyrium** (4 to 8 grs. in 1 oz.) for ordinary or purulent **conjunctivitis**.

Genitals.—It makes a capital wash (1 dr. in 1 pint) for **vulvitis** of **children**, if the parts are frequently irrigated and a piece of lint soaked in the lotion is left in situ. It also relieves **pruritus**. A douche (10 grs. to 1 oz.) removes **leucorrhœa**, checks slight **hæmorrhage** from **patulous os** after abortion or delivery, and benefits **prolapsed uterus**. A weak solution (3 grs. in 1 oz.) is successfully employed in **gonorrhœa** as an injection.

Rectum.—A daily wash with a solution of alum (6 grs. in 1 oz.) after defæcation benefits **prolapse of the rectum** and **hæmorrhoids**.

Internally. Mouth.—Alum is commonly used as a dentifrice in **ulcerated and spongy gums**. A solution (5 to 10 grs. in 1 oz.) is a useful gargle in **sore throat, elongated uvula, tonsillitis, salivation, and aphthous and ulcerative stomatitis**, but Glys. Aluminis is a better application in these cases. Dusting with dried alum is sometimes used as a solvent for **diphtheritic and croupous false membranes**. In the form of a spray, alum may be employed in **hoarseness and chronic coughs**.

Stomach and intestine.—Alum is considered to be an efficient non-depressant **emetic** in **croup and bronchitis**. Meigs uses 1 dr. of alum with honey or syrup every 10 or 15 minutes till the child vomits. By lessening the congestion of the stomach caused by constant coughing, it is said to control the **vomiting of phthisis and pertussis**. As an astringent, it is used in **chronic diarrhoea** and as a local hæmodynamic in **gastro-intestinal hæmorrhage**. Alum-whey obtained by curdling 1 pint of milk with 2 drs. of alum may be given with benefit in enteric and other **diarrhoeas**. In 30 gr. doses frequently repeated, it relieves **lead colic** by opening the bowels and precipitating lead salts as insoluble lead sulphates.

Lungs.—Alum is vaunted as a remedy for **whooping cough** but it is doubtful whether it is really of any use in this disease. It is said that 10 grs. of powdered alum placed dry on the tongue sometimes checks a fit of **asthma**.

AMMONIACUM

Ammoniacum. N. O. *Umbelliferae*

Habitat.—Persia, the Punjab.

Source.—A gum-resin exuded from the flowering and fruiting stems of *Dorema ammoniacum*, and probably other species.

Characters.—In pale yellowish or brownish tears, or in nodular masses $\frac{1}{4}$ to 1 in. in diameter; hard, brittle when cold, having a waxy lustre in freshly fractured surface; soft when warmed. Internally opaque from milk white to brownish-yellow. Odour faint, characteristic, but not alliacious. Taste bitter, acrid. Forms a white emulsion with water.

Identification.—It resembles *galbanum*, *benzoin*, and *asafetida*, from which it can be distinguished by its odour, and the following test:—If a small fragment be heated to redness in a dry test-tube, the contents of the tube, after cooling, yield with boiling water a solution which, when largely diluted with water and made alkaline with ammonia solution, does not exhibit a blue fluorescence (distinction from *asafetida* and *galbanum*).

Composition.—(1) Gum 20 p.c., (2) Resin 70 p.c., (3) Volatile oil 4 p.c.

Action.—Stimulant expectorant. **B.P. Dose.**—5 to 15 grs.

Enters into.—Pil. Ipecac. c. Scilla, Pilula Scilla Co., and the

OFFICIAL PREPARATIONS

1. **Emplastrum Ammoniaci cum Hydrargyro.**—12 in 15.

2. **Mistura Ammoniaci.**—13½ grs. in 1 oz. A milk-like emulsion. **B.P. Dose.**—½ to 1 oz.

PHARMACOLOGY

Externally.—Applied locally, ammoniacum gently stimulates the blood-vessels and nerves of the part, thereby promoting the absorption of morbid products. It is therefore a **resolvent**. This action is greatly augmented when it is combined with mercury, as the B.P. ammoniacum and mercury plaster, which, if applied for any length of time, gives rise to a sort of rash.

Internally.—Like oleo-resins and aromatics, it is excreted by the bronchial glands, stimulating and disinfecting their secretion. Hence it is a **remote stimulating disinfectant expectorant**. In large doses it is a laxative.

THERAPEUTICS

Externally—As a *resolvent* the plaster is employed in **sympathetic buboes, enlarged and indolent glands, and chronic inflammatory joint diseases**, such as synovitis, rheumatic swellings, &c.

Internally.—Ammoniacum is a valuable remedy for **chronic bronchitis** of the old and emphysematous. In 10 to 30 gr. doses three or four times a day, it loosens adhesive mucus, checks wheezing and facilitates expectoration.

AMMONII BENZOAS. See Benzoinum

AMMONII BROMIDUM. See Bromum

AMMONIUM. Ammonia

F Source.—Ammonia is chiefly obtained from the liquor of the gasworks and from iron-smelting furnaces and paraffin shale, and purified.

AMMONIÆ LIQUOR FORTIS

Strong solution of Ammonia. NH_3

Source.—An aqueous solution obtained by heating a mixture of ammonium chloride and slaked lime, and passing the gas (ammonia) into distilled water. Contains $32\frac{1}{2}$ p.c. of NH_3 by weight.

Characters.—A colourless, alkaline liquid; odour characteristic, very pungent. Sp. gr. 0.891. **Impurities.**—Chloride, sulphide, and sulphate of ammonia, lime metals.

Identification.—The characteristic odour helps diagnosis.

Action.—Vesicant.

Enters into.—Lint. Hydrarg., Tr. Guaiac. Ammon., and in the preparation of Ammon. Benz., Ammon. Brom., Ammon. Phosph., and the

OFFICIAL PREPARATIONS

1. **Liquor Ammonia.**—10 p.c. by weight. *Enters into.*—Tr. Ergot. Ammon., Tr. Opii Ammon., Tr. Quin. Ammon., Tr. Valer. Ammon., and

(a) **Linimentum Ammonia.** *Syn.*—Hartshorn Liniment.—1 in 4. Ammonia soap is formed by the mixture.

2. **Linimentum Camphoræ Ammoniatum.**—1 in 8.
3. **Spiritus Ammoniæ Aromaticus.**—*See* Ammonium Carbonate.
4. **Spiritus Ammoniæ Felidus.**— $1\frac{1}{2}$ in 20. **B.P. Dose.**—20 to 30 ms. for repeated use, and 60 to 90 ms. for a single dose.

NON-OFFICIAL PREPARATIONS

1. **Lotio Crinalis.**—Ol. Amygdal. 1, Liq. Ammon. Fortis 1, Sp. Ros. marini 4, Aq. Mellis 2. **Mix.**
2. **Tr. Ammoniæ Comp.** *Syn.*—*Eau de Luce.*—Mastic 2 drs., Alcohol (90 p.c.) 9 drs., Ol. Lavand. 14 ms., Liq. Ammon. Fort. 20 ozs. **Dissolve.** A local application to *snake-bite*.

PHARMACOLOGY

Externally.—A solution of ammonia when rubbed in or applied to the skin stimulates the peripheral nerves and superficial blood-vessels, producing a sensation of heat and redness. If it is concentrated and evaporation prevented, it blisters. Ammonia is therefore a **rubefacient** and **vesicant**.

Nose and air-passages.—The vapour of ammonia powerfully irritates the mucous membrane of the nose and air-passages causing sneezing. It also irritates the conjunctiva producing lachrymation. By exciting the nasal afferent nerves, it **reflexly stimulates circulation**, and accelerates pulse-beat. If the inhalation is prolonged or the vapour is too concentrated, inflammation of the nasal and air-passages results.

Internally.—On reaching the stomach, ammonia at once **reflexly stimulates the heart and circulation** by its action on the accelerator centre. After absorption this action is continued and **respiration is accelerated**. Like other alkalis it neutralizes the acidity of the gastric juice if given after food and increases the flow if given before. It also increases peristalsis and causes a sense of warmth in the stomach. Therefore, it is an **antacid, gastric stimulant** and **carminative**. In large doses, it is a **gastro-intestinal irritant**.

Blood.—Ammonia slightly increases the alkalinity of the plasma, and is supposed to lessen the coagulability of the blood, and to dissolve any clot that may have already formed.

Heart. Its action is stimulated reflexly as well as after absorption by excitation of the accelerator centre.

Lungs.—Respiration is increased by direct stimulation of the **respiratory centre** after absorption. Ammonia is partly eliminated by the bronchial glands, whose secretion it increases. Rossback found that after applying a weak solution to the mucous membrane of the trachea of a living animal, there was a decided **congestion** of the surface with increased mucous discharge.

Nervous system.—Ammonia is a **general stimulant**, because it stimulates the respiratory and accelerator centres. It has no action

on the brain. It acts on the nerves when locally applied, causing tingling and burning. In toxic doses, it produces convulsions owing to the stimulation of the motor cells in the cord.

Kidneys.—Ammonia and its salts are decomposed in the blood and tissues, the chief changes probably take place in the liver, and the ultimate result is urea, uric acid, and nitric acid. Therefore (N.B.) ammonia **increases the acidity of the urine.**

Elimination.—Ammonia is thrown off with the breath, sweat, urine and bronchial secretion.

Toxic action.—If a large dose of a concentrated solution be swallowed, it may cause death within a few minutes from suffocation due to spasm of the glottis. Otherwise the symptoms are those of poisoning by a corrosive alkali.

Antidotes.—The same as those of the other alkalis.

THERAPEUTICS

Externally.—As a *local stimulant* to nerves and blood-vessels, the liniment of ammonia is rubbed into **stiff joints**, and in various conditions of **chronic rheumatism**; and as a *counter-irritant* on the chest in **bronchitis, pneumonia and pleurisy**. Ammonia may be used as a *vesicant* in cases where cantharides is contra-indicated. A piece of lint cut slightly larger than the intended blister is moistened with the strong solution and applied, and immediately covered over with a watch-glass. Ammonia neutralizes the poison of **nettles** and **insect-bites** and thereby lessens the pain and swelling caused by them. A hypodermic injection of compound tincture of ammonia has been found efficacious in the bites of less poisonous snakes. Lotion Crunalis is an excellent application for promoting the growth of the hair.

The vapour (smelling-salts) is used to rouse patients from **fainting, shock, syncope, and stupor** and **narcotic poisoning**.

Internally.—Like other alkalis, ammonia may be given in **acid dyspepsia**. Spirit of sal volatile is a useful remedy for **gastric and intestinal cramps**; a few drops with soda and dill-water giving relief to **flatulence** in infants. As a general diffusible stimulant, ammonia is extremely serviceable in **syncope, shock, fainting** and in the low adynamic conditions of **febrile diseases, pneumonia, phthisis, &c.** It makes an excellent "pick-me-up." It softens the phlegm in bronchitis and catarrhal pneumonia, but the carbonate is better. Ammonia controls *iodism*, and is therefore combined with iodides when prescribed in large doses.

AMMONII CARBONAS

Ammonium carbonate

Syn.—Ammonium Sesquicarbonate.

Source.—A variable mixture of ammonium, hydrogen carbonate NH_4HCO_3 with ammonium carbamate $\text{NH}_4\text{NH}_2\text{CO}_2$, obtained by

subliming ammonium sulphate or chloride with calcium carbonate; thus $2\text{CaCO}_3 + 4\text{NH}_4\text{Cl} = \text{N}_2\text{H}_{11}\text{C}_2\text{O}_5 + 2\text{CaCl}_2 + \text{H}_2\text{O} + \text{NH}_3$.

Characters.—In volatile, translucent, crystalline masses; odour ammoniacal; reaction alkaline. Effloresces when exposed to air. *Solubility*—1 in 4 of cold water. *Impurities.*—Sulphates and chlorides.

Identification.—The odour and the translucent appearance, particularly when freshly broken, help recognition. A white powdery coating forms on samples exposed to air.

Incompatibles.—Acids, acid salts, lime water, iron salts, alkaline earths, and alkaloids.

Dispensing hints.—The powdery coating should be scraped off before dispensing.

Action.—Antacid, stimulant, expectorant, emetic.

B.P. Dose.—3 to 10 grs. As a stimulant and expectorant; 30 grs. as an emetic.

Enters into.—The preparation of Ammonium Chloride, Bismuth Carb., Ferri Carb. Sacch., and the

OFFICIAL PREPARATIONS

1. **Liquor Ammonii Acetatis.** *Syn*—*Spirit of Minderer*.—Stimulant, diuretic, diaphoretic. Should be neutral or slightly acid. Stock in green bottles. **B.P. Dose.**—2 to 6 drs.

2. **Liquor Ammonii Citratis.**—About 16 p.c. Diuretic, diaphoretic. Stock in green bottles. **B.P. Dose.**—2 to 6 drs.

3. **Spiritus Ammoniae Aromaticus.** *Syn.*—*Spt. Ammoniae Compositus*, *Spirit of Sal Volatile*.—(Cardiac stimulant.

B.P. Dose.—20 to 40 ms. for repeated use, 60 to 90 ms. for a single dose. Should not be prescribed with Syrupus Scillae.

NON-OFFICIAL PREPARATIONS AND DERIVATIVES

1. **Liq. Ammon. Acet. Fort., B.P. 1885.**—1 with 5 of distilled water forms the official diluted Liq. Ammon. Acet. *Dose.*—25 to 75 ms.

2. **Liq. Ammon. Citratis Fort., B.P. 1885.**—1 to 3 of distilled water forms the official Liq. Ammon. Citratis. *Dose.*—30 to 90 ms.

3. **Ammonii Bicarbonas.**—More palatable and less caustic. Suitable for relieving draughts. *Dose.*—3 to 10 grs.

4. **Ammonii Fluoridum.**—In *enlarged spleen*. *Dose.*—5 to 20 ms. of the solution (4 grs. in 1 oz.).

5. **Ammonii Picras.**—In yellow scales soluble in water. In *ague* and *malarial fevers*. *Dose.*— $\frac{1}{2}$ to $1\frac{1}{2}$ grs., 4 or 5 times daily.

6. **Ammonii Tartras.**—Expectorant. *Dose.*—5 to 30 grs.

7. **Smelling salts.**—There are several kinds. The following is a sample of *inexhaustible salts*—Ammon. Chloride $1\frac{1}{2}$ ozs., Pot. Carb. 1 oz. 6 drs., Camphor 1 dr., Ammon. Carb. 3 drs., Oil of Cloves 10 ms., Oil of Bergamot 10 ms., Oil of Spearmint 4 ms. Powder the solids and mix the oils.

8. **Pick-me-up.**—Spt. Ammon. Arom. $\frac{1}{2}$ dr., Spt. Chlorof. $\frac{1}{2}$ dr., Tr. Gentian. Co. 1 dr., Tr. Card. Co. 2 drs., Syrup 2 drs., Aq. ad. 2 ozs. M. for a dose.

PHARMACOLOGY AND THERAPEUTICS

Externally.—Ammonium carbonate is never used externally, though it has the same actions as those of Liqr. Ammonia. Spiritus Ammonii Aromaticus is inhaled for reflex stimulation.

Internally.—The carbonate possesses all the virtues of the liquor, and in addition is a **powerfully stimulating expectorant**, facilitating the expulsion of viscid mucus. It is therefore very useful in **bronchitis**, and **catarrhal pneumonia**. It is an **emetic** in $\frac{1}{2}$ dr. doses, though rarely used for this purpose.

In large doses (20 to 30 grs.), it acts also as a **purgative**. Sometimes, even in small repeated doses if continued for long, it **irritates the bowels**. The carbonate should not therefore be given in cases complicated with **diarrhœa**.

The solution of the acetate and citrate are **diaphoretics**, acting possibly either on the secreting cells or on the periphery of the secreting nerves of the sweat-glands (*see* p. 148), but the acetate appears to be more powerful. If the patient is kept cool, their action concentrates upon the kidneys and produces diuresis. For these actions, they are used as mild, non-depressant **antipyretics in fevers**. They are also given to counteract the effects of immoderate indulgence in alcohol.

Prescribing hints.—The carbonate is best given well diluted in milk, or syrup and water. Liqr. Ammon. Acetat. 2 ozs., Pot. Acetas 2 drs., Spt. Æther. Nitrosi 4 drs., Syrup and water to 8 ozs. make a good non-depressant **diaphoretic mixture**, which may be used in any **febrile disease**. Liqr. Ammon. Acetat. 2 ozs., Ammon. Carb. 40 grs., Pot. Iodide 16 grs., Vin. Antim. 40 mss., Syrup and water to 8 ozs. make a capital mixture for **catarrhal pneumonia**.

AMMONII CHLORIDUM

Ammonium Chloride. NH_4Cl

Syn.—Sal Ammoniac. **Syn. I. V.**—*Nishedal*, Beng. *Noshidar*, Hind.

Source.—Prepared by neutralizing crude solution of ammonia or ammonium carbonate with hydrochloric acid. Thus $\text{NH}_4\text{HO} + \text{HCl} = \text{NH}_4\text{Cl} + \text{H}_2\text{O}$.

In India this is manufactured from a peculiar clay found at Karnal in the Punjab and is easily obtainable in the bazaars.

Characters.—In colourless, inodorous crystals. **Solubility.**—1 in 3 of cold water, 1 in 60 of alcohol (90 p.c.). **Impurities.**—Iron, lead, and tarry matters.

Identification.—The peculiar fibrous, translucent appearance helps recognition.

Incompatibles.—Alkalis and their carbonates, alkaline earths; lead and silver salts.

Dispensing hints.—It is not easy to powder ammonium chloride, and is best done by dissolving the salt in hot water and evaporating the solution to dryness with constant stirring (*see* p. 11). The powder is granular and cannot be recognised.

Action.—Hepatic stimulant, expectorant.

B.P. Dose.—5 to 20 grs.

Enters into.—The preparation of Liq. Ammon. Fort.

NON-OFFICIAL PREPARATIONS

1. **Lotio Evaporans.**—Ammon. Chlorid. $\frac{1}{2}$, Spt. Rect. 2, Water to 12 Dissolve.
2. **Lotio Refrigerans** (Sir A. Cooper).—Ammon. Chlorid. 5, Pot. Nitr. 5 Water 16. Dissolve.
3. **Troch. Ammon. Chlor.**—2 to 3 grs. in each. In *bronchitis*.
4. **Vapor. Ammon. Chlor.**—(Obtained by mixing hydrochloric acid and ammonia in a suitable apparatus and purifying through water or moist sponge. A useful inhalation in *bronchitis*.)

PHARMACOLOGY AND THERAPEUTICS

Externally.—A solution of ammonium chloride has a **soothing refrigerant** effect when locally applied, and this is greatly increased by the addition of alcohol and potassium nitrate. Hence, the evaporating and cooling lotions are useful in *sprains, bruises, fractures, dislocations, headache, cerebral congestion, apoplexy, &c.* They may also be applied to threatening mammary abscess and glandular inflammations. In the form of an inhalation, ammonium chloride increases the secretion of mucus from the pharynx, larynx, trachea, bronchi and Eustachian tubes, and is therefore serviceable in chronic **pharyngitis, laryngitis, bronchitis** and **otitis media**.

Internally. **Gastro-intestinal canal.**—Ammonium chloride when allowed to melt slowly in the mouth acts as a **reflex expectorant**. In moderate doses, 10 to 15 grs., it is a **gastro-intestinal stimulant** particularly to the intestine. It is an excellent remedy for **gastric catarrh**. It is said to relieve the vomiting and heartburn due to cancer of the stomach.

Liver.—It stimulates the secretion of **bile** (*see* p. 131) and is used in **catarrhal jaundice**, subacute and chronic **congestion, enlargement** and **threatening abscess** of the liver.

Lungs.—It is a stimulating **expectorant** whether given internally or by inhalation, and is serviceable in **bronchial catarrh** without fever. 10 grs. dissolved in about 3 ozs. of cold water, sipped frequently, relieves the distressing fits of coughing in bronchitis.

Nervous system.—It is not a cerebral stimulant. In 30 gr. doses it sometimes relieves **migraine, clonus hystericus, myalgia, sciatica** and **intercostal** and **hepatic neuralgia**. As an alterative it is sometimes given in **gout** and **rheumatism**.

Kidneys.—It has feeble **diuretic** properties, and is given in **dropsy** caused by hepatic disorders.

Prescribing hints.—It may be given in powder, compressed tablets, lozenges or in a mixture. Its taste is best disguised by chloroform

and syrup or extract of liquorice (*see* p. 116). In the absence of an inhaler, the vapour produced by simply heating ammonium chloride on a dish may be inhaled.

AMMONII PHOSPHAS

Ammonium Phosphate. $(\text{NH}_4)_2\text{HPO}_4$

Source.—Obtained by neutralizing solution of ammonia with phosphoric acid; thus $2\text{NH}_4\text{OH} + \text{H}_3\text{PO}_4 = (\text{NH}_4)_2\text{HPO}_4 + 2\text{H}_2\text{O}$.

Characters.—Transparent colourless prisms. **Solubility.**—1 in 4 of water, insoluble in alcohol (90 p.c.).

Action.—Direct cholagogue, diuretic. **B.P. Dose**—5 to 20 grs.

PHARMACOLOGY AND THERAPEUTICS

Internally.—It is a direct **hepatic stimulant**, and **diuretic**. It decomposes the insoluble urate of sodium and forms soluble ammonium urate and sodium phosphate; and is therefore recommended in gout and uric acid diathesis.

AMYGDALA AMARA

Bitter Almond. *N. O. Rosacea*

Syn. I. V.—*Tiktabádám*, Beng. *Korú bádám*, Hind.

Source.—The ripe fruit of *Prunus amygdalus*, var. *amara*.

Characters.—Resembles the sweet almond in appearance, but shorter and broader; taste bitter. Its aqueous emulsion emits the characteristic odour.

Composition.—(1) *Purified fixed oil* (non-poisonous) 50 p.c. (2) *Emulsin* or *synapsin* an albuminoid ferment. (3) *Amygdalin* a crystalline glucoside, which in the presence of water and emulsin is decomposed into *hydrocyanic acid*, *glucose*, and an *essential oil*—*oleum amygdale amare*. The pure essential oil is non-poisonous, but an artificial oil—Benzaldehyde prepared from Toluene—is often sold in its stead.

AMYGDALA DULCIS

Sweet Almond

Source.—The ripe seed of *Prunus amygdalus*, var. *dulcis*, known in commerce as the Jordan almond.

Characters.—About 1 in. long, oblong, compressed, acute at one end rounded at the other. Testa brown, thin, rough, cotyledons two, only exalbuminous. Its aqueous emulsion does not emit any odour. **Purity.**—Bitter almond.

Composition.—(1) *Fixed oil*, 50 p.c. (2) *Emulsin* and other albuminous products.

OFFICIAL PREPARATIONS

1. **Mistura Amygdalæ.**—1 in 8. **B.P. Dose.**— $\frac{1}{2}$ to 1 oz.
2. **Pulvis Amygdalæ Compositus.**—8 in 13. **Dose.**—60 to 120 grs.

NON-OFFICIAL PREPARATIONS

1. **Almond Cosmetic Cream**.—Blanched Almond 1 oz., Rose Water 4 ozs. Make a paste.

OLEUM AMYGDALÆ

Almond Oil

Source.—The oil expressed from the bitter or sweet almond.

Characters.—Pale yellow, nearly inodorous, with a bland nutty taste. Sp. gr. 0.915 to 0.920. **Solubility**.—In ether, chloroform, slightly in alcohol (90 p.c.). **Impurities**.—Peach-kernel oil and apricot-kernel oil.

Action.—Emollient, demulcent, laxative. **Dose**.—1 to 4 drs.

Enters into.—Lin. Ammon., Ol. Phosph., Ung. Aquæ Rosæ, and Ung. Cetacci.

NON-OFFICIAL PREPARATION

1. **Lime Juice and Glycerin**.—Almond Oil $3\frac{1}{2}$ drs., Oil of Lemon 1 dr., Lime-water to 8 ozs. Mix by shaking. Glycerin 1 dr. may be added to justify the name. A popular preparation for the hair.

PHARMACOLOGY AND THERAPEUTICS

Externally.—A paste of sweet almond is a **demulcent** and **emollient**, and is used as a cosmetic. Indian ladies make a paste with cream of milk. Almond oil being a bland oil makes a good basis for many hair-oils and ointments. It is a soothing application for **chapped hands, excoriations and irritable skin diseases**. The *Mistura Amygdalæ Amaræ* made in the same way as *Mist. Amygdalæ* may relieve itching of the skin.

Internally.—Sweet almond is **nutritive**. Its flour being devoid of starch is given to diabetic patients as a substitute for starchy food, the only objection to its use being its high price. The flour of Brazil nuts may be used as a cheaper substitute, but is not so palatable. The almond mixture and compound powder are agreeable vehicles for suspending insoluble drugs.

The oil is a mild **purgative** in 2 to 4 drs. doses. An **enema** of 1 to 3 pints of the oil has been found effective in impaction of fæces and obstruction of bowels. Is pleasanter than olive oil, great expense limits its use and leads to frequent adulteration.

AMYL NITRIS

Amyl Nitrite

Source.—Obtained by the interaction of amyl alcohol which has been distilled between 262° and 270° F. and nitrous acid. Consists chiefly of iso-amyl nitrite ($C_5H_{11}NO_2$), but contains other nitrites of the homologous series.

Characters.—A yellowish ethereal liquid; odour fragrant; reaction faintest acid; sp. gr. 0.870 to 0.880; *very volatile*. **Solubility**.—In alcohol

(90 p.c.) and almost insoluble in water. *Impurities*.—Free acid and amyl nitrate.

Identification.—Its fragrant odour resembling that of the *champa* plantain of Bengal or the ripe pineapple helps recognition.

Dispensing hints.—As the drug is *extremely volatile* it should be kept in hermetically sealed bottles in a cool place. Agitation or heat helps evaporation.

Incompatibles.—Alkaline carbonates, Potassium Iodide, Bromides, and ferrous salts.

Action.—Arterial dilator and cardiac accelerator.

B.P. Dose.—2 to 5 ms. for inhalation, $\frac{1}{2}$ to 1 m. by the mouth.

NON-OFFICIAL PREPARATIONS

1. **Amyl Nitrite Capsules**.—Glass capsules containing 1, 2, 3, or 5 ms., encased in cotton-wool and silk. Before use the capsule is broken within a handkerchief and inhaled.

2. **Isobutyl Nitrite** may be used as a substitute for amyl nitrite.

3. **Tertiary Amyl Nitrite**. *Syn*—*Berton's Ether*.—Possesses all the properties of amyl nitrite, but may be taken in larger doses, and does not produce flushing of the face.

PHARMACOLOGY

Externally.—Amyl nitrite is a direct local **depressant** to the sensory nerves, but the action is transitory.

Internally. Blood.—It enters the blood readily through the lungs and stomach, and circulates as a sodium nitrite. If absorbed in sufficient quantity, it converts the hæmoglobin into methæmoglobin and another body—nitric oxide hæmoglobin—and renders the arterial and venous blood chocolate coloured, and thereby interferes with the oxidizing property of the corpuscles. In ordinary doses the effect is slight and the methæmoglobin is soon deoxidized, but in toxic doses these changes are enough to kill. The inhalation of oxygen soon reconverts methæmoglobin.

Heart and blood-vessels.—Within a minute of inhalation, face, head and neck become warm and flushed, the carotids and their branches throb, head feels full and tense, and **heart beats rapidly and violently**, soon followed by headache, giddiness, rapid breathing and dilatation of the pupils. If the dose is large, the **arterioles of the whole body dilate**, as the result of weakening or paralysis of their muscular coats, for the dilatation occurs if the cord is destroyed. Hence the **blood-pressure** and **arterial tension are greatly lowered**. The **acceleration of the pulse-beat** without any increase of its force is due to the depressed condition of the vagal roots owing to the diminution of the blood-pressure. In toxic doses the heart may stop in diastole on account of direct action on the cardiac muscle.

Lungs.—Respiration is at first quickened by stimulation of the respiratory centre, later on it becomes laboured and difficult, and finally ceases altogether when the centre becomes asphyxiated.

Nervous system.—Most of the nervous symptoms such as headache, giddiness, throbbing in the head, dilatation of pupils, &c., are due to the dilatation of the arterioles of the brain and cord. In large doses reflex action is abolished owing to the profound paralysis of the motor centres in the cord. The functions of the sensory and motor nerves are affected a few minutes before death.

Temperature.—Under the influence of amyl nitrite the temperature falls considerably both in health and fever. This is due to peripheral vascular dilatation and diminished metabolism.

Urine.—It escapes with the urine as nitrites and nitrates, and is a feeble diuretic. It may produce glycosuria, possibly by dilatation of the hepatic blood-vessels.

THERAPEUTICS

Inhalation.—The profession first learned the use of amyl nitrite in **angina pectoris** from Branton who, seeing that it dilated the arterioles, used it in this disease with startling effects. Five drops give speedy relief, especially if the disease is paroxysmal. It may even afford relief to angina when there is no vaso-motor contraction. In fact, it relieves, though temporarily, any **cardiac pain**, of paroxysmal nature. The pain of **thoracic aneurism** is often allayed by it. The “flushing” or “heat” which many females experience during the menopause may be controlled by this drug. It may arrest a fit of **epilepsy** if inhaled as soon as the aura is perceived, and may cut short a fit of **ague** if inhaled at the beginning of the cold stage. In **migraine** due to spasm of the blood-vessels of one side of the face, as indicated by the paleness of the affected side, inhalation of amyl nitrite gives relief. It has been found useful in **syncope**, **fainting**, **suspended animation** as in drowning and hanging, and **chloroform** and **opium poisoning**.

On account of its action in lowering blood-pressure its use has been advocated in **hæmoptysis** and **hæmatemesis**, but its value in these cases is doubtful.

It has been found efficacious in uncomplicated **asthma**, relieving dyspnoea within a short time. It also temporarily affords relief to **cardiac dyspnoea** accompanied by anasarca, caused by dilated and hypertrophied heart. It is useful in **sea-sickness**. It may relieve the pain of **dysmenorrhœa**, relax **uterine spasms** and arrest the fits of **eclampsia**. It has been suggested for employment in **tetanus** and **strychnine poisoning**.

Caution.—It should be used with great caution in sensitive and nervous persons, who are powerfully affected by it. It should not be administered to persons suffering from aortic diseases, or those whose arteries are atheromatous, or to those who are emphysematous, plethoric or suffer from chronic bronchitis.

Prescribing hints.—Inhalation is the usual method, though it may be given by the mouth and subcutaneously. The drug may be poured on a handkerchief, or a **glass capsule** broken within its folds

and inhaled. By the mouth, it is best given diluted with brandy on sugar, or suspended by mucilage in a mixture. The glass capsules keep better in India. Patients may become habituated to its use, so that after a while it has to be inhaled several times before it gives relief.

AMYLUM. Starch

N.O. *Graminaceæ*

Syn. I. V.—*Shetsár*, Beng.

Source.—Prepared from the grains of common wheat, *Triticum sativum*; maize, *Zea Mays*; and rice, *Oryza sativa*.

Characters.—In fine white powder or masses, inodorous.

Incompatible.—Iodine.

Enters into.—The preparation of Pulv. Tragacanth. Co. and the

OFFICIAL PREPARATION

1 **Glycerinum Amyli.**—1 in 9, or 1 in 10 by weight.

PHARMACOLOGY AND THERAPEUTICS

Externally.—Starch is bland and non-irritating and may be used as a protective and absorbent in a weeping eczema or excoriated and inflamed surfaces, as slight burns. In the form of Violet Powder, which is merely perfumed starch, it is used to prevent chafing or excoriation of the skin of infants. Generally it is used as a basis for dusting powders and insufflations. Glyc. Amyli is a good application for chilblains and chapped hands.

Internally.—It is a food and an antidote for poisoning by iodine. Mucilage of starch (1 in 40) is used for preparing enemas.

ANDROGRAPHIS. Andrographis

N.O. *Acanthaceæ*. (*Ind. and Col. Addendum.*)

Syn.—Creat, Kiryat. **Syn. I. V.**—*Kálmeg*, Beng. *Kreat*, Hind.

Habitat.—India and Eastern Colonies.

Source.—The dried plant of *Andrographis paniculata*.

Characters.—*Stem.*—1 to 3 ft. high, quadrangular, slightly winged, longitudinally furrowed, colour dark green. *Leaves.*—Opposite, shortly petioled, lanceolate, entire; upper surface, dark green, shining; lower surface granular. They vary in size. *Flowers.*—Calyx small, hairy, five-cloft; capsules cylindrical, two-valved. *Root.*—Simple, fusiform, woody. No odour in dried plant. Taste intensely bitter.

Composition.—(1) A non-basis bitter principle. (2) Tannic acid. (3) Sodium chloride.

OFFICIAL PREPARATIONS

1. **Infusum Andrographis.**—1 in 20. Andrographis cut small 1 oz., distilled boiling water 1 pint. Infuse for 15 minutes.

B.P. Dose.— $\frac{1}{2}$ to 1 oz.

2. **Liquor Andrographidis Concentratus.**—1 in $\frac{2}{3}$. Andrographis 10 ozs., Alcohol (20 p.c.) 25 ozs. By percolation to 1 pint. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.

3. **Tinctura Andrographidis.**—1 in 10. Andrographis 2 ozs., Alcohol (60 p.c.) q.s. By percolation to 1 pint. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.

NON-OFFICIAL PREPARATIONS

1. **Tr. Andrographidis Co., I.P.**—Andrographis cut small 6 ozs., Myrrh 1 oz., Aloes 1 oz., Proof Spirit q.s. to 40 ozs. Macerate for 7 days. Useful in *constipation and torpidity of the liver*.

2. **Pilula Andrographidis Co. (Alui).**—Caraway fruits, *raduni* (*Ptychotis involucrata*), anise, cloves, and pericarps of greater cardamoms, of each equal parts. Make a pill-mass with the *juice* of Andrographis and divide into pills of the size of a pea. An Indian domestic remedy administered with human milk in *infantile diseases*.

PHARMACOLOGY AND THERAPEUTICS

Internally.—Andrographis is a **bitter stomachic, tonic, anthelmintic and febrifuge**, generally employed in children's ailments; such as *flatulency, diarrhoea, dysentery, loss of appetite, &c.*

Drs. Carter, Dymock and Arjun reported on the drug as being a bitter tonic and stomachic, useful in general debility, convalescence after fevers and advanced stages of dysentery. As a tonic, stimulant and gentle aperient they consider it useful in **dyspepsia and torpidity of the liver**.

In short Creat possesses properties almost similar to those of Quassia.

ANETHI FRUCTUS

Dill Fruit. N.O. *Umbelliferae*

Syn. I. V.—*Soyá* or *Sowá*, Hind.

Habitat.—Middle and Southern Europe and Tropical India.

Source.—The dried ripe fruit of *Peucedanum graveolens*.

Characters.—The fruit consists of two mericarps freed from pedicel. Each is broadly oval; $\frac{1}{8}$ in. long and $\frac{1}{4}$ to $\frac{1}{2}$ in. broad; compressed dorsally. brown; dorsal ridges inconspicuous, but lateral ones prolonged into *wings*. Each mericarp exhibits 6 *vitæ*. Odour and taste aromatic.

Identification.—It resembles *Anise, Fennel, Caraway, and Conium*, from which it is distinguished by the presence of *wings*.

Composition.—The *Volatile oil*, official (*q.v.*).

Action.—Carminative.

OFFICIAL PREPARATION

1. **Aqua Anethi.**—*Dose.*— $\frac{1}{2}$ to 2 ozs.; 1 to 2 drs. for a child 1 year old.

OLEUM ANETHI. Oil of Dill.

Source.—Obtained by distilling dill fruit.

Characters.—Colour pale yellow; odour that of the fruit; taste sweet, aromatic. Sp. gr. 0.805 to 0.920. *Solubility.*—In alcohol and ether.

B.P. Dose.— $\frac{1}{2}$ to 3 ms.

Composition.—(1) *A Terpene* (limonene). (2) *Carvol*.

PHARMACOLOGY AND THERAPEUTICS

The oil of dill fruit is an **aromatic, stimulant, antiseptic,** and **carminative**, and is used to relieve **flatulency** and **intestinal colic**. It corrects the griping of purgatives. Dill water is chiefly used to remove flatulency in children.

ANISI FRUCTUS

Anise fruit. N.O. *Umbelliferae*

Syn. I. V.—*Mouri*, Beng. *Sonf*, Hind. *Anisum*, Rom.

Habitat.—Central and Southern Europe and Northern India.

Source.—The dried ripe fruit of *Pimpinella anisum*.

Characters.—Ovoid, laterally compressed, covered with hairs, greyish-brown, $\frac{1}{4}$ in. long, $\frac{1}{2}$ in. broad, odour agreeably aromatic, taste aromatic, sweet. Mericarps remain united and attached to the pedicel; each mericarp exhibits *many vittae*.

Composition.—The chief constituent is the official *volatile oil* (q.v.).

Identification.—It resembles *Dill*, *Caraway*, *Fennel*, and *Conium* from which it can be distinguished by general characters.

OFFICIAL PREPARATION

1. **Aqua Anisi.**—1 in 10. *Dose.*— $\frac{1}{2}$ to 2 ozs.

OLEUM ANISI. Oil of Anise

Source.—Obtained by distilling anise fruit, or star-anise fruit, *Illicium verum* (N.O. *Magnoliaceae*).

Characters.—Colourless or pale yellow, odour of the fruit, taste mildly aromatic. Sp. gr. 0.975 to 0.990.

Composition.—(1) *Anethol*. (2) *Anisic aldehyde*. (3) *Methyl-chavicol*.

Action.—Antispasmodic, carminative.

B.P. Dose.— $\frac{1}{2}$ to 3 ms.

Enters into.—Tr. Camph. Co., Tr. Opii Ammon., and the

OFFICIAL PREPARATION

1. **Spiritus Anisi.**—1 in 10. **B.P. Dose.**—5 to 20 ms.

PHARMACOLOGY AND THERAPEUTICS

The action and uses of anise are almost identical with those of dill, except that it has a slight **expectorant** property and is often prescribed as a vehicle for cough mixtures.

ANTHEMIDIS FLORES

Chamomile Flowers. N.O. *Compositae*

Syn. I. V.—*Bábuná-ful*, Hind.

Habitat.—Throughout Europe and some parts of India.

Source.—The dried expanded flower-heads of *Anthemis nobilis*, collected from cultivated plants.

Characters.—About $\frac{1}{2}$ to $\frac{3}{4}$ in. in diameter, hemispherical white or nearly white. Involucre composed of several rows of oblong bracts with membranous margins. Receptacle solid, covered with bracts. Florets ligulate, white; odour aromatic; taste bitter.

Composition.—(1) *Volatile* oil, official (*q.v.*). (2) *Extractives*.

Action.—Aromatic, stimulant, and bitter tonic.

OFFICIAL PREPARATION

1. **Extractum Anthemidis.**—Contains 15 ms. of oil of chamomile for every 1 lb. **B.P. Dose.**—2 to 8 grs.

OLEUM ANTHEMIDIS. Oil of Chamomile

Source.—The oil distilled from chamomile flowers.

Characters.—Pale blue or greenish-blue, becoming yellowish-brown. Odour and taste of the flowers. Sp. gr. 0.905 to 0.915.

Composition.—(1) *A terpene*. (2) *Angelic and tiglic esters* of isobutyl, amyl, and hexyl alcohols. (3) *A bitter principle*.

Enters into.—Ext. Anthemid. **B.P. Dose.**— $\frac{1}{2}$ to 3 ms.

PHARMACOLOGY AND THERAPEUTICS

Externally.—A warm infusion, decoction or poultice is a domestic remedy for SPRAINS and INFLAMMATIONS in their early stages.

Internally.—The flowers are **aromatic, bitter** and **stomachic** and may be given in **atonic dyspepsia**. A large draught of warm infusion acts as an **emetic**, and may be given in **ague** and **biliousness**. The oil is often combined with purgatives to correct their griping properties. The tincture of the German chamomile is praised by Dr. Ringer in summer diarrhoea of children.

ANTIMONIUM NIGRUM PURIFICATUM

Antimonious Sulphide. Sb_2S_3

Source.—The native antimonious sulphide purified.

Antimonious tersulphide is found in the Himalayan mountains and is known as *Surmā* in India.

Characters.—A greyish-black crystalline powder. **Impurities.**—Arsenic and other sulphides.

Enters into.—The preparation of Antim. Sulph.

ANTIMONII OXIDUM

Antimonious Oxide. Sb_4O_6

Source.—Prepared by pouring solution of antimonious chloride into water, $SbCl_3 + H_2O = SbOCl + 2HCl$, and decomposing the precipitate antimony oxychloride with sodium carbonate, $2SbOCl + Na_2CO_3 = Sb_2O_3 + 2NaCl + CO_2$.

Characters.—A greyish-white powder. **Solubility.**—Readily in HCl, insoluble in water, alcohol, and HNO₃. **Impurities.**—Higher oxides.

Action.—Diaphoretic, emetic.

B.P. Dose.—1 to 2 grs., $\frac{1}{6}$ to $\frac{1}{4}$ gr. for a child 1 year old.

Enters into.—The preparation of Antimonium Tart. and the

OFFICIAL PREPARATION

1. **Pulvis Antimonialis.**—A substitute for *James' Powder*.—1 in 3. **B.P. Dose.**—3 to 6 grs.; $\frac{1}{4}$ to $\frac{1}{2}$ gr. for a child 1 year old.

ANTIMONIUM SULPHURATUM

Sulphurated Antimony

Source.—A mixture containing antimony sulphides and oxides, Sb₂S₃, Sb₂O₅, Sb₂S₃, Sb₄O₆, and sulphur, prepared by boiling antimonious sulphide with sublimed sulphur and solution of caustic soda and adding diluted sulphuric acid and water.

Characters.—A dull red powder. **Solubility.**—Insoluble in water.

Action.—Diaphoretic, alterative, emetic. **B.P. Dose.**—1 to 2 grs.

Enters into.—Pil. Hydrarg. Subchlorid. Co.

ANTIMONIUM TARTARATUM

Tartarated Antimony. $\text{K}(\text{SbO})\text{C}_4\text{H}_4\text{O}_6 \cdot \frac{1}{2}\text{H}_2\text{O}$

Syn. B.P.—Potassio-tartrate of antimony. *Tartar Emetic*.

Source.—Prepared by setting aside a mixture of antimonious oxide and acid potassium tartrate, made into a paste with a little water, until combination has taken place, and then purifying by crystallisation from water.

Characters.—Colourless, transparent crystals with triangular facets. Taste sweet, metallic. **Solubility.**—1 in 17 of cold, 1 in 3 of boiling water. The solution is acid. **Impurity.**—Acid tartrate of potassium.

Incompatibles.—Alkalis, lead salts, gallic and tannic acids, and most astringent substances.

Action.—Diaphoretic expectorant, cardiac sedative, emetic.

B.P. Dose.—Diaphoretic, $\frac{1}{4}$ to $\frac{1}{2}$ gr.; expectorant, $\frac{1}{8}$ to $\frac{1}{4}$ gr.; emetic, 1 to 2 grs., given in solution or powder. (*Carefully note the doses.*)

OFFICIAL PREPARATION

1. **Vinum Antimoniale.**—2 grs. to 1 oz.

B.P. Dose.—10 to 30 ms.; 2 to 4 drs. as an emetic. For a child 1 year old 3 ms. as an expectorant and 15 ms. as an emetic.

PHARMACOLOGY

Externally.—Salts of antimony cause a characteristic local inflammation, at first papular, then vesicular and lastly pustular, simulating

smallpox. This is due to the formation of insoluble irritant precipitates at the orifices of sweat-glands by the acid solution (perspiration). Hence they are **irritants** and **pustulants**.

Internally. Gastro-intestinal tract.—The local effects of antimony on the mouth, fauces, œsophagus and stomach are the same as on the skin if it is taken in toxic doses or continued long medicinally. In small doses it produces a sense of warmth and soreness in the stomach, and in larger doses loss of appetite, nausea and increased secretion of gastro-intestinal mucus. In still larger doses, 2 to 3 grs., it **induces vomiting**, due to (1) the direct stimulation of the gastric nerves reflexly exciting the vomiting centre, and (2) the stimulation of the vomiting centre through the medium of blood which becomes evident if the drug is injected into the circulation and the stomach is replaced by a bladder. A portion of the drug is **excreted** by the gastro-intestinal mucous membrane, and causes vomiting again by its remote local effect. If given largely diluted with water it causes less vomiting but more purging. In toxic doses it induces **gastro-enteritis**, with symptoms resembling those of cholera.

Heart and circulation.—Soluble antimonial salts enter the blood readily, but do not appear to combine with the albumen of the plasma. From the beginning, even in small doses, antimony reduces the **force and frequency of the cardiac beat**, which tends to become intermittent, and in large doses the heart becomes **profoundly depressed** with acceleration of the pulse-rate. The **blood-pressure falls** considerably (1) partly from the depressed condition of the heart, (2) partly from the relaxed state of the arterioles caused by the depression of some portion of the vaso-motor system, and (3) partly reflexly from the stomach (nausea). Hence, antimony is a **powerful cardiac and circulatory depressant**. (Compare its action with that of aconite on the heart, p. 207.)

Lungs and respiration.—Respiration is very much **depressed** after a brief stimulation. Inspiration becomes short, expiration prolonged, and finally respiratory movements irregular. Antimony is eliminated by the bronchial mucous membrane, and acts as an **antiphlogistic expectorant**.

Temperature is not much affected in health, but is **reduced in fevers**, owing chiefly to (1) the depressed condition of the circulation, (2) diaphoresis, and (3) to some extent, diminished metabolism.

Liver.—Tartar emetic particularly antimonium sulphuratum directly increases the **secretion of bile**, and is therefore a **direct cholagogue**. It tends also to increase the formation of urica and carbonic acid, and depresses the glycogenic function. If continued long, it causes **fatty degeneration**. In these respects its action resembles those of arsenic and phosphorus (*q.v.*).

Skin.—It is a **powerful diaphoretic**, due chiefly to (a) the depressed condition of the circulation, and possibly to some extent (b) the remote local effect on the sweat-glands. Like arsenic it affects the skin of frogs, making the cuticle a soft jelly-like mass which can be scraped off easily (see p. 174).

Kidneys.—Tartar emetic in passing through the kidneys may produce a slight **diuretic** effect, depending very much on the action of the skin.

Nervous system.—Tartar emetic is a **powerful sedative** to the nervous system, especially the sensory and motor tracts of the cord, which are affected directly and not through the blood. The cerebrum is also depressed though not so profoundly, causing a feeling of languor, inaptitude for mental exertion, lowness of spirits and sleepiness.

Muscular system.—Both the voluntary and involuntary muscles, especially the former, are **profoundly depressed and relaxed**, chiefly by nauseating doses. It is therefore a muscular **antispasmodic**.

Metabolism.—Its effects on metabolism are pretty much the same as those of phosphorus and arsenic (which see). In minute doses it has a slight **alterative** action, but in continued doses it clings to the tissues tenaciously for some months, producing (a) a fatty degeneration of the organs, especially the liver, (b) an increased formation of nitrogenous products, and (c) a deficient oxidation in the tissues. According to Ringer, antimony is a protoplasmic poison and paralyses the functions of nitrogenous tissues like arsenic, aconite and hydrocyanic acid.

Elimination.—Antimonial salts are excreted by the kidneys, liver, skin, mucous membranes of the bronchi and gastro-intestinal tract and mammary glands. A portion is retained in the body.

Toleration.—Large doses given several times a day sometimes do not induce vomiting, thereby producing tolerance of the drug. This is probably due to the arrest of the acid secretion from its irritant effects (Brunton).

Acute toxic action is very much the same as that of arsenic (see p. 174). The *post-mortem* appearances are not so marked as in arsenical poisoning.

Antidotes.—Emetics or stomach-pump if vomiting is not free. *Tannin is the chief antidote* in any shape. Strong tea, coffee, gallic acid, astringent infusions, and demulcent drinks should be freely given. Stimulants, strychnine and digitalin subcutaneously are also necessary. *Chronic toxic action* is rare nowadays. For butter of antimony the antidotes are the same as those for mineral acids (see p. 195).

The action of tartar emetic resembles in many respects that of

aconite, and the student will no doubt find assistance by studying the following table :—

Tartar emetic	Aconite
1. An irritant and pustulant to the skin and mucous membrane.	A sensory depressant and anæsthetic to the same.
2. An emetic, and purgative in large doses.	A gastro-intestinal irritant in toxic doses.
3. A powerful cardiac, circulatory and respiratory depressant.	The same.
4. Lowers blood-pressure.	The same.
5. An antiphlogistic expectorant.	Nil.
6. A powerful depressant to the cord, and to a less extent to the brain. A muscular relaxant.	A powerful depressant to the sensory nerve-endings. Only large doses cause muscular weakness.
7. A powerful diaphoretic.	Not so powerful as a diaphoretic.
8. An antipyretic.	The same.
9. A cholagogue, especially antimonium sulphuratum.	Nil.
10. Causes fatty degeneration and is deposited in the tissues.	Nil.

THERAPEUTICS

Externally.—As a *counter-irritant*, tartarated antimony ointment is not used now, though in former days it was largely employed in diseases of the lungs, meninges and joints.

Internally. **Gastro-intestinal tract.**—As an *emetic*, tartar emetic is not suitable in cases of **poisoning** on account of its tardy action and the general prostration it induces, but is of great service in those cases of acute inflammatory affections of the respiratory tract, such as **croup** and **bronchitis** where both emesis and vascular depression are needed. **Intermittent fevers**, rebellious to quinine, yield when it is given after an antimonial emetic.

Circulation and respiration.—As an *antiphlogistic*, tartarated antimony in $\frac{1}{10}$ gr. doses may be given like aconite in a variety of acute inflammatory diseases at the outset, such as **tonsillitis**, **laryngitis**, **acute bronchitis**, **pneumonia**, **pleurisy**, **pericarditis**, **peritonitis**, **ovariitis**, &c. In **acute bronchial affections** of children, antimony still holds a high place when given alone or in combination with ipecacuanha. Half to one teaspoonful of wine as an emetic, followed by 3 to 5 drops every one or two hours, keeps up expectoration and wards off bronchial spasms.

Fevers.—Tartarated antimony at once cuts short an attack of **catarrhal fever**. As a *diaphoretic* it may sometimes be given to reduce the pyrexia in sthenic subjects. Pulv. Antimonialis Co. is a mild diaphoretic, and may yet occasionally be prescribed in **catarrhal fever** and **broncho-pneumonia** with good results. To check delirium Graves recommends the use of tartar emetic with opium.

Nervous and muscular systems.—Tartarated antimony may be used also to allay the excitement in **mania** and to induce sleep in **acute alcoholism**. Before the introduction of general anæsthetics, it was largely employed as a **relaxant of muscles**, in **dislocations** and **hernia**. Even now it is occasionally given to relax the **rigidity** of the **os** during parturition.

As an *alterative and cholagogue*, antimonium sulphuratum is often given in **gout** and **hepatic fulness**. With calomel (Plummer's pill) it is given in **syphilis**.

Prescribing hints.—Tartarated antimony is seldom used now. Being a soluble and tasteless salt it is best given in solution. It should be commenced in very small doses, $\frac{1}{60}$ to $\frac{1}{40}$ gr., for it has been found that $\frac{1}{40}$ gr. taken repeatedly causes vomiting. It should never be given as a purgative, and in order to prevent this action it is often combined with opium. Its action on the bronchial mucous membrane is greatly augmented if it is combined with iodides or ipecacuanha.

APOCYNUM. U.S. (Non-official)

Syn.—Canadian Hemp.

Source.—Root of *Apocynum cannabinum*.

Composition.—The root contains a resin, *Apocynin*, and a glucoside, *Apocynin*.

Action.—Emetic, cathartic, diaphoretic, and diuretic. **Dose.**—1 to 20 grs. of powdered root.

NON-OFFICIAL PREPARATIONS

1. **Tinctura Apocyni, B.P.C.**—(1 in 10). **Dose.**—5 to 60 ms.
2. **Ext. Apocyni Fluidum.**—1 oz. equals 1 oz. of root. **Dose.**—5 to 15 ms.

PHARMACOLOGY AND THERAPEUTICS

In large doses it is a powerful **emetic** and **diaphoretic**. It is also a **cathartic** and **diuretic** and is therefore useful in **dropsy** and **Bright's disease**.

It exerts a powerful slowing action on the heart but resembles strophanthus more than digitalis. **Uræmia** may often be warded off by profuse diuresis produced by this drug: it is also useful in causing the absorption of **pleuritic effusions**. For these reasons it is commonly known in America as the "Vegetable Trocar." Is very little used in Europe, but is much esteemed in India.

APOMORPHINÆ HYDROCHLORIDUM. See Opium

AQUA DESTILLATA. Distilled Water. H_2O

Source.—Prepared by distillation from good potable water.

Characters.—Colourless, tasteless, odourless. Should be free from metals, chlorides, nitrates, nitrites, or sulphates.

Used in pharmacy and making up preparations.

PHARMACOLOGY OF WATER

Externally.—The actions of water in different forms and of different temperatures have been fully described under the heads of Baths, Fomentations, Poultices, &c. (see pp. 62-5, 67, and 69-70).

Boiled or sterilized water is almost free from micro-organisms and is therefore an **antiseptic**. Hot water is also a local **hæmostatic**.

Internally. **Alimentary canal.**—Water is an essential article of food. It allays thirst reflexly as well as by diluting the plasma after absorption. When drunk in moderation and at definite hours, it increases the secretion of saliva, bile, and gastro-intestinal and pancreatic juices. Large quantities derange digestion and cause diarrhœa. Warm water acts as an **emetic** and hot water a **gastric sedative**.

Blood and circulation.—Water is quickly absorbed into the blood. A sudden influx of water into the circulation, if the body has suffered a great loss of the same, may cause death from rapid destruction of corpuscles by osmosis.

Kidneys.—Copious drinking flushes the kidneys and bladder and carries with it effete products circulating in the blood, such as excess of urica, phosphoric and sulphuric acids and sodium chloride, but lessens the amount of uric acids. Thus water is a natural **diuretic**.

Skin.—In hot weather, a glass of water is sufficient to bring on perspiration with many persons, but in cold, warm drinks do this with the aid of external warmth. Water is therefore a powerful **diaphoretic**.

Metabolism.—Water plays an important part in tissue metamorphosis. Taken under certain precautions, it facilitates construction and destruction of tissues, and thus acts as a true **metabolic stimulant**. Hence is the improvement of patients under the water-treatment.

THERAPEUTICS OF WATER

Externally.—Besides its uses already adverted to in pages 62-5, 67, 69, water, in the form of ice, or constantly changed through a Leiter's coil, is useful in subduing many acute inflammatory diseases, such as **meningitis, cerebritis, synovitis, sprains, &c.** It contracts not only the superficial blood-vessels, but also those of the organs by reflex action. On the same principle, a local application of ice to the surface arrests internal hæmorrhages, such as **epistaxis, hæmoptysis, hæmatemesis, &c.** A sudden partial application of cold to the abdomen, by flapping a wet towel over it, excites contraction of the parturient womb, and is therefore employed in **uterine inertia** and **post-partum hæmorrhage**. A smart sprinkling of cold water on the face restores consciousness in **hysteria, fainting** and **narcotic and chloroform poisoning**. The same plan may be adopted in reviving still-born infants. Iced water subcutaneously injected over the diaphragm checks **hiccough**, and within paralysed muscles improves

their nutrition. Iced poultices applied to the chest are used in the treatment of pneumonia. Hot water injected into the womb arrests post-partum hæmorrhage.

Internally.—The sucking of ice allays thirst, vomiting and hiccough. A small glass of cold water slowly sipped controls the craving for drinks by stimulating the circulation. In the same manner, hot water before meals soothes the irritable conditions of the stomach in gastritis, gastrodynia and gastric ulcers. A glass of cold water taken immediately on rising from bed helps the bowels to act. The swallowing of ice arrests hæmatemesis. Copious draughts of water help to wash out minute deposits of urinary gravel. If it is a uric acid calculus, drinking of distilled water diminishes the tendency to deposition. Large draughts of water given between meals may arrest the formation of gall-stones by liquefying the bile. As an emetic, warm water should not be given in quantities sufficient to over-distend the stomach, as this may paralyse its muscular fibres and thereby impede rather than promote vomiting. Half to one pint at a time is enough for the purpose.

ARACHIS OLEUM. Arachis Oil

N.O. *Leguminosæ*. (*Ind. and Col. Addendum.*)

Syn. B.P.—Earth-nut oil, Ground-nut oil.

Syn. I. V.—*Chnâ-bâdimer tel*, *Mâtkalâner tel*, Beng. *Mungphalike tel*, Hind.

Habitat.—India, Africa, and Eastern Colonies.

Source.—Expressed without heat from the seeds of *Arachis hypogæa*.

Characters.—Pale-yellow or greenish-yellow, odour faint nut-like, taste bland, nutty. Sp. gr. 0.916 to 0.918. Becomes rancid and thick slowly.

Composition.—(1) *Oleic*, (2) *Hypogæic*, (3) *Palmitic*, (4) *Arachic acids*.

PHARMACOLOGY AND THERAPEUTICS

Externally.—The oil makes a good substitute for olive and almond oils, and has long been used in Indian pharmacy in their stead, though not with the sanction of the B.P.

Internally.—It has a gentle aperient action. The seeds are very nutritive, as they contain 31.9 p.c. of nitrogenous compounds, 37.8 p.c. of starch and sugar and 11.8 p.c. of fatty matter. They are largely eaten in India, Africa and America.

ARAROA. Araroba

N.O. *Leguminosæ*

Syn. B.P.—Goa Powder, Crude Chrysarobin.

Habitat.—Brazil (Bahia).

Source.—Found in cavities in the trunk of *Andira araroba*, freed as much as possible from fragments of wood, dried and powdered.

Characters.—Brownish yellow to amber-brown powder, yielding to hot chloroform not less than 50 p.c. of chrysarobin.

Enters into.—The preparation of Chrysarobin (*q.v.*).

CHRYSAROBINUM. Chrysarobin

Source.—Obtained from araroba by extracting with hot chloroform, evaporating to dryness and powdering.

Characters.—Crystalline, yellow, tasteless, inodorous powder. *Solubility.*—Entirely in hot chloroform, almost entirely in alcohol (90 p.c.), partially in petroleum spirit, slightly in water.

Composition.—(1) *Chrysarobin*, Syn.—*Rhein*, *Chrysophan*. (2) *Chrysophanic Acid*.

OFFICIAL PREPARATION

1. **Unguentum Chrysarobini.**—1 in 25.

NON-OFFICIAL PREPARATIONS

1. **Pigmentum Chrysarobini.**—Chrysarobin 1 dr., Chloroform 10 drs., Gutta-percha (pure) 1 dr. Dissolve. Does not stain cloth.
2. **Ung. Acid. Chrysophanici** (Malcolm Morris).—Acid. Chrysophanic, 20 grs., Ol. Deelinæ 2 drs., Lanolin to 1 oz. Mix.

PHARMACOLOGY

Externally.—Chrysarobin is a powerful irritant to the skin, producing a sort of erythematous inflammation. It does not irritate so much the diseased parts as the healthy skin. It destroys low vegetable growths infesting the surface of the body, and is therefore a powerful parasiticide. It is absorbed from the skin.

Internally.—Even in small doses, say $\frac{1}{8}$ gr., it powerfully irritates the gastro-intestinal mucous membrane, causing anorexia, vomiting and purging with gripes. It is therefore a powerful gastro-intestinal irritant.

It is eliminated chiefly by the kidneys and partly by the skin. The urine is stained purple.

THERAPEUTICS

Externally.—As a parasiticide, it is a capital remedy for ringworm and other forms of tinea. The B.P. ointment not being strong enough, requires its strength to be increased occasionally. It is also useful in many chronic dry skin diseases, such as psoriasis, eczema, acne rosacea. An ointment ($\frac{1}{2}$ to 1 dr. in 1 oz. of heated vaseline) rubbed into the parts night and morning, acts like a charm in chronic psoriasis. Applied thus locally it also acts constitutionally, probably by absorption, since after a time patches of psoriasis to which it has never been applied also show signs of improvement and tend to disappear.

Internally.—It should not be prescribed internally on account of its irritating properties, though success has sometimes attended its internal administration in psoriasis, eczema, acne, &c.

Prescribing hints.—Chrysarobin should not be applied to the face, as it is apt to cause conjunctivitis, though a mild ointment (15 grs. to 1 oz.) may not produce much irritation if applied to the scalp. To prevent the irritation of the surrounding healthy skin, its application should be *exclusively confined to diseased islands*. This may best be done by painting the parts with Pig. Chrysarobini, and covering the pigment with collodion, or by applying a stiff ointment covered over with a piece of isinglass or Mead's plaster. The stains on the linen may be removed by a weak solution of potash or chlorinated lime, and partially by vegetable acids. Chrysarobin should never be applied to a large surface of the body at one time, otherwise it may produce most unpleasant symptoms. In cases of extensive ringworm, treat the disease bit by bit, curing one patch before you attack another.

ARGENTI NITRAS

Silver Nitrate. AgNO_3

Syn. B.P.—Lunar Caustic.

Source.—Prepared by the interaction of nitric acid and silver, $5\text{Ag} + 8\text{HNO}_3 = 2\text{NO} + 6\text{AgNO}_3 + 4\text{H}_2\text{O}$.

Characters.—(Colourless, tabular, rhombic crystals. *Solubility.*—2 in 1 of water. *Impurities.*—Other nitrates.

Incompatibles.—Alkalis and their carbonates, bromides, chlorides, phosphates, iodides, acids (except nitric and acetic), alkaloids, and solutions of arsenic and tannin.

Dispensing hints.—It should be stocked and dispensed in amber-coloured or uranium bottles (*see* p. 75), and its pill massed with kaolin and paraffin ointment (*see* p. 88).

Action.—Caustic, astringent, antiseptic, and nerve tonic.

B.P. Dose.— $\frac{1}{4}$ to $\frac{1}{2}$ gr. *Daily Dose.*—3 grs. in pill.

OFFICIAL PREPARATIONS

1. **Argenti Nitras Induratus.** *Syn.*—*Toughened Caustic.*—Greenish-white cylindrical rods or cones obtained by fusing silver nitrate 475 grs. and potassium nitrate 25 grs. in a platinum capsule, and pouring into moulds.

2. **Argenti Nitras Mitigatus.** *Syn.*—*Mitigated Caustic*—Greyish-white rods or cones obtained by fusing silver nitrate 1 oz. and potassium nitrate 2 ozs., as above.

ARGENTI OXIDUM

Silver Oxide. Ag_2O

Source.—Prepared by mixing solutions of Silver Nitrate and calcium hydroxides, $2\text{AgNO}_3 + \text{Ca(OH)}_2 = \text{Ag}_2\text{O} + \text{Ca(NO}_3)_2 + \text{H}_2\text{O}$.

Characters.—A brown powder which at a low red heat gives oxygen and yields metallic silver.

Incompatibles.—Chlorides, organic substances, creosote, phenol, potassium permanganate (*see* p. 109), iodine, potassium iodide, and bromide.

Action.—Tonic, antispasmodic. **B.P. Dose.**— $\frac{1}{2}$ to 2 grs. in pill.

NON-OFFICIAL PREPARATIONS AND DERIVATIVES OF SILVER

1. **Pigmentum Argenti Nitras Æthereum.** L.H.—Silver Nitrate 20 grs., distilled Water 1 dr., Spt. Ether. Nitrosi to 1 oz. As a paint on greasy skin.

2. **Argentamin.**—A solution of silver phosphate in ethylene-diamine solution. Antiseptic and astringent. As an injection (1 in 2000 to 4000) in gonorrhœa.

3. **Itrol.** *Syn.*—*Argenti Citras.*—A non-caustic powder soluble 1 in 4000 of water. Antiseptic, astringent.

4. **Actol.** *Syn.*—*Argenti Lactas.*—In powder or crystals soluble in water. Antiseptic, astringent.

5. **Argentol.**—A compound of silver with oxychinoline. A sparingly soluble yellowish powder acting like iodoform. As an injection (1 in 1000) in gonorrhœa.

6. **Argentum Colloidale** (Crede's). *Syn.*—*Collargol.*—Metallic silver in a colloid state. Its ointment (Argen. Coll. $\frac{1}{2}$ oz., Aqua Dest. $1\frac{1}{2}$ drs., Cera Alba $2\frac{1}{2}$ drs., Adop. Benz. 2 ozs. $2\frac{1}{2}$ drs.) is rubbed in septic and inflammatory diseases with doubtful results.

7. **Argonin.**—A silver-casein compound soluble in hot water. Antiseptic, parasiticide. A 1 to 5 p.c. solution injected in gonorrhœa.

8. **Largin.**—A silver-albumen compound. A powerful germicide. 1 to 6 grs. in water 1 oz. for injection in gonorrhœa.

9. **Argenti Iodidi.**—An alterative in gastralgia and syphilis. *Dose.*— $\frac{1}{4}$ to 1 gr. in pill.

10. **Protargol.**—A silver-protein compound. A powerful germicide. A $\frac{1}{4}$ to 1 p.c. solution makes a painless injection in gonorrhœa. A solution ($\frac{1}{4}$ to $1\frac{1}{4}$ in $1\frac{1}{2}$ ozs. of water) has been successfully used as a prophylactic against gonorrhœal infection, and internally in continued acute catarrhal diarrhœa. In gonorrhœal ophthalmia.

11. **Albergin.**—A similar compound. Contains 15 p.c. of silver. A 0.2 p.c. solution useful as an injection in gonorrhœa.

12. **Argenti Acetas.**—White crystals, freely soluble in water. A 1 p.c. solution suggested for purulent ophthalmia of infants, as being less irritant.

13. **Argenti Fluoridum.** *Syn.*—*Tachiol.*—A powerful non-toxic bactericide.

14. **Argyrol.** *Syn.*—*Vitellin.*—A combination of a silver salt with a proteid obtained from wheat, contains 30 p.c. of metallic silver; very soluble in water, but not in alcohol. An excellent non-irritating application for mucous membranes. Solutions should vary from 2 to 5 p.c., according to the nature of the case. For cystitis use 1 in 5000 solution. As a mild caustic 1 in 100. In ophthalmic practice.

15. **Ichthargan.**—*Silver ichthyolate.* A light-brown odourless amorphous powder containing 30 p.c. silver. Powerful antiseptic .02 to 2 p.c. in gonorrhœa. 1 to 3 p.c. in affections of posterior urethra.

16. **Novargan.**—A fine yellow odourless powder. Antiseptic, useful in gonorrhœa.

PHARMACOLOGY OF SILVER SALTS

Externally.—Soluble silver salts unite chemically with the albumen of the tissues and discharges to form albuminates, but their action does not penetrate into the deeper tissues. Applied to the unbroken skin in the form of a stick or concentrated solution silver nitrate produces at first a white stain which soon becomes blackened by exposure to light. This stain peels off as a dry black scale if the application is very light, or as a black slough if the application is prolonged. Hence it is a **caustic**. On a raw surface a solution of silver nitrate acts as an **excitant** and is (1) decomposed by the albumen of the plasma and discharges, and is precipitated as an albuminate which coats its surface, (2) contracts the blood-vessels and capillaries, and (3) coagulates the blood both within and without them. It is therefore a local **astringent, hæmostatic** and **antiphlogistic**. All silver salts are powerful **antiseptics**.

Internally. **Mouth.**—Silver nitrate is decomposed by the albumen and chlorides of the saliva, and imparts an astringent taste. In a concentrated form it acts in the same way as on the skin. If administration is prolonged, it produces a dark bluish discoloration at the edges of the gums and on the inside of the cheeks.

Stomach and intestine.—The undecomposed portion reaching the stomach is again acted upon by the hydrochloric acid and mucus, forming a double chloride of silver and sodium. In moderate doses it acts as an **astringent**, though this is doubted by some authorities, and in large doses as a **gastro-intestinal irritant**. Peptones dissolve the nitrate readily, and the solution does not precipitate albumen.

Blood.—Silver enters (we know not in what form) the blood. If it is not soon excreted or deposited in the organs, it collects in the red blood corpuscles and converts the hæmoglobin into hæmatin. Opinions differ as to its action as a **remote astringent**.

Nervous system.—Many believe that silver in minute doses acts as a **nervine tonic** like copper or zinc. In toxic doses it is a **convulsant**, the convulsions being like those in strychnine poisoning. According to Gowers, it blunts the polarity of the nerve-centres so that they are less easily influenced by external stimuli.

Skin.—If administered continuously, silver causes a leaden discoloration of the skin, due to the deposition of the reduced metal (?) in all the tissues of the skin except the *rete Malpighii*. Once deposited, it causes permanent disfigurement.

Elimination.—Silver salts are excreted with the fæces as a sulphide, staining them dark-brown, and by the intestinal secretion and bile. A portion is deposited in the organs, particularly the kidneys and liver.

Acute toxic action.—Severe vomiting, general prostration, and nervous symptoms, particularly convulsions, are the chief symptoms.

Chronic toxic action.—If silver is given internally for a long time, it causes impairment of digestion and nutrition, albuminuria, irregular cardiac action, paralysis as in lead poisoning, fatty degeneration, and discoloration of the skin and other organs (*argyria*).

Antidotes.—In *acute poisoning* from accidental causes, mucilaginous drinks, such as thick gruel, should be immediately given to envelope the caustic; this should be followed by an emetic or stomach syphon. Common salt is the *chemical antidote*. White of egg, milk and water, and other demulcents may be given freely.

THERAPEUTICS OF SILVER SALTS

Externally. Skin.—The solid silver nitrate or mitigated caustic is of little value for destroying small **warts** or **excrescences**. It may be applied to **exuberant granulations**, **callous**, **indolent** or **lupoid ulcers**, **fistulae**, **chancres**, &c., because of its limited caustic and after-stimulating effects on them. It is a **valuable caustic** for **post-mortem wounds**, but not a reliable one for bites by poisonous snakes and rabid animals, as its action does not penetrate into the deeper layers. It arrests **bleeding from leech-bites**. Its solution may arrest the **pitting of smallpox** if painted on the vesicles with or without previous puncture. It is a capital remedy (1 to 2 drs. in 1 oz.) for arresting the progress of **erysipelas** and threatening **boils**. A milder solution (5 to 20 grs. in 1 oz.) disperses threatening **bed-sores**, **herpes** and **eczema** if painted over the erythematous patches. It allays the itching of **pruritus**. A solution of silver nitrate turns grey hair bluish-black. To effect this the hair is first washed with silver nitrate solution (1 in 12), and then a comb or brush dipped in a solution of potassium sulphurat. (1 in 8) is applied.

Eyes and nose.—A solution of silver nitrate (5 to 10 grs. in 1 oz.) cures **granular conjunctivitis** and **ophthalmia neonatorum**. The conjunctiva must first be rendered anæsthetic by means of cocaine. The silver solution is then applied with a camel's-hair brush, and the excess of caustic afterwards neutralised by irrigation with normal saline solution. A weaker solution (1 to 4 grs. in 1 oz.) may be used as a collyrium in **purulent conjunctivitis**. A weak solution makes a valuable irrigation in **rhinitis**.

Ear.—Brushing the meatus with a strong solution of silver, avoiding the membrana tympani, often relieves intolerable **pruritus** of the meatus.

Genitals.—Solid caustic is still used for cauterising **granular** or **ulcerated os** and **cervix**. A strong solution may be injected into or painted within the womb in **endometritis** or **endocervicitis**. A weaker solution (1 to 2 grs. in 1 oz.) makes an effective injection in **gonorrhœa**, **leucorrhœa** and **pruritus pudendi** due to leucorrhœa. Irrigation (1 in 1000 to 10,000) has been successfully used in many cases of gonorrhœa. Many advocate injections of largin, itrol and protargol in gonorrhœa (*see* p. 254).

Internally. Alimentary canal.—Unhealthy or chronic ulcers in the mouth quickly heal after being touched with mitigated caustic. A solution (10 to 20 grs. in 1 oz.) is an excellent application for sore throat acute or chronic, **pharyngitis**, **follicular tonsillitis** and **tubercular** and other ulcerations of the **larynx**.

Chronic diarrhoea, rebellious to other drugs, sometimes yields to silver nitrate. As an enema (1 dr. in 3 pints), it has been successfully employed in **chronic dysentery** and **ulcerations** of the **bowels**.

Nervous system.—As a tonic it was formerly much esteemed in many nervous diseases, such as **locomotor ataxy**, **hemiplegia** and **epilepsy**, but the unpleasant symptoms of **argyria** are the chief barrier to its use, and on that account nitrate of silver is now very rarely used by neurologists.

Silver oxide is less irritating and has sometimes been found very useful in **gastrodynia**, and as a remote hæmostatic in **menorrhagia**.

Caution.—To avoid **argyria**, the use of the drug must be suspended as soon as a dark line is noticed on the edges of the gums which may be removed by a course of acid tartrate of potassium. Its administration must be stopped for two weeks after two months' use, however small the dose may be. 100 grains should be the maximum dose per month.

Prescribing hints.—Silver salts are given in pills (*see* p. 88) after food, but if their local action on the stomach is desired, they should be given on an empty stomach, preferably in solution. For application to the skin, a solution of the nitrate in nitrous ether is the best, as it does not run in drops, and it is a stronger preparation than the aqueous solution.

ARISTOLOCHIA. *Aristolochia*

N.O. *Aristolochiaceæ*

(*Ind. and Col. Addendum*)

Syn.—The Indian Butthwort. **Syn. I. V.**—*Isarnul*, Beng., Hind.

Habitat.—India and Eastern Colonies.

Source.—The dried stem and root of *Aristolochia Indica*.

Characters.—*Stem*—In cylindrical pieces $\frac{1}{2}$ in. in diameter, greyish-yellow, marked with scars and furrows. *Root*—Dark-brown, transversely constructed, bark separable from wood. Odour spicy, camphoraceous. Taste bitter.

OFFICIAL PREPARATIONS

1 **Liquor Aristolochiæ Concentratus.**—*Aristolochia* 10 ozs., Alcohol (20 p.c.) 25 ozs. or *q.s.* By percolation to 1 pint.

B.P. Dose.— $\frac{1}{2}$ to 2 drs.

2. **Tinctura Aristolochiæ.**—Powdered *Aristolochia* 4 ozs., Alcohol (70 p.c.) *q.s.* By percolation to 1 pint. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.

PHARMACOLOGY AND THERAPEUTICS

Externally.—The expressed juice of the root and leaves is considered by the natives of India an antidote to snake-bites when applied to the bitten part.

Internally.—The drug is a mild **bitter tonic** and is said to be useful in intermittent fever and other affections. It does not possess any other properties and is therefore not fit to be retained in the B.P.

ARMORACIÆ RADIX. Horseradish Root

N.O. *Cruciferae*

Habitat.—Britain, Europe, North America.

Source.—The fresh root of *Cochlearia armoracia* collected from cultivated plants.

Characters.—Nearly cylindrical except at the crown where it is enlarged, marked with semi-amplexicaul leaf-scars.

Identification.—It is strange that this root has been mistaken for Aconite root. Their differential characters are tabulated below :—

Horseradish Root

Size.—Larger, $1\frac{1}{2}$ in. in diameter.

1 ft. long, nearly cylindrical.

Colour.—Pale - yellowish without, whitish and fleshy within.

Odour.—Pungent.

Taste.—Pungent.

Aconite Root

Size.—Smaller, $\frac{1}{2}$ to $\frac{3}{4}$ in. diameter, gradually tapering.

Colour.—Dark - brown without, whitish and starchy within.

Odour.—Nil.

Taste.—Persistently tingling.

Composition.—(1) A volatile oil allied to the volatile oil of the black mustard seeds. (2) Other constituents.

Action.—Sialagogue, stimulant, diuretic.

OFFICIAL PREPARATION

1. **Spiritus Armoraciæ Compositus**.—1 in 8. **B.P. Dose**.—1 to 2 drs.

PHARMACOLOGY

Externally.—It is a **rubefacient** like mustard, but is never used as such.

Internally.—It increases the salivary and gastric secretions, and after absorption stimulates the kidneys and sweat-glands during its excretion. It is therefore a **sialagogue, gastric stimulant, diuretic** and a feeble **diaphoretic**.

THERAPEUTICS

Internally.—An infusion of equal parts of fresh root and black mustard seeds has been found to be an effective **gargle** for relaxed conditions of the throat. The root may be chewed in **toothache** and **paralysis** of the tongue and cheeks. It has been usefully employed in **atonic dyspepsia, chronic rheumatism** and **dropsy**. The compound spirit is a good flavouring carminative.

ARNICÆ RHIZOMA

Arnica Rhizome. N.O. *Compositæ*

Syn. B.P.—*Arniciæ Radix*.

Habitat.—Mountainous regions of Central and Southern Europe.

Source.—The dried rhizome and roots of *Arnica montana*.

Characters.—Cylindrical, dark brown, 1 to 2 in. long, $\frac{1}{8}$ to $\frac{1}{4}$ in. thick, curved, rough. Bears amplexicaul-scars and wiry rootlets. Taste acid, bitter. Odour aromatic.

Identification.—It resembles *Serpentary* and *Valerian* distinguishable by their general characters and their characteristic odours, and *Veratrum viride* distinguishable by its thicker rootlets.

Compositions.—(1) *Arnica* the active principle. (2) *Volatile oil*. (3) *Inulin*. (4) *A resin*.

OFFICIAL PREPARATION

Tinctura Arnicae.—1 in 20.

ARNICÆ FLORES. Arnica Flowers

(*Ind. and Col. Addendum*)

Source.—The flower-heads of *Arnica montana*.

Characters.—The flower-heads consist of a scaly involucre in two rows and a hairy receptacle, bearing 16 to 20 yellow three-toothed, ten-nerved ray-florets, and numerous yellow five-toothed tubular disc florets. Odour aromatic. Taste bitter.

OFFICIAL PREPARATION

1. **Tinctura Arnicae Florum.**—Flowers 2 ozs., Alcohol (45 p.c.) *q.s.* By percolation to 1 pint. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.

PHARMACOLOGY

Externally.—Arnica **stimulates** the **cutaneous blood-vessels**, and when its evaporation is stopped, causes hyperæmia, eczema and spreading erythematous inflammation simulating erysipelas.

Internally.—Like volatile oils, it is a **warm aromatic** and **stimulant** to the alimentary canal, increasing gastric and intestinal peristalsis. In large doses, it is a powerful **gastro-intestinal irritant**. In small doses, it **reflexly excites** the vascular and nervous systems, and in large doses depresses them, producing partial insensibility, convulsions and syncope. It is a **remote stimulant** to the skin and kidneys.

THERAPEUTICS

Externally.—Arnica is chiefly used as a lotion (1 to 4 drs. in 1 pint) in **bruises** and **sprains**. According to Garrod the good effects, if any, are due to the spirit of the same strength rather than to the tincture.

Internally.—Many fancied therapeutical uses have been suggested, e.g. in fever, delirium tremens, rheumatism, chronic bronchitis, dysentery, with doubtful results. The tincture of the flowers is considered more active than that of the root and is largely employed in the American Colonies. An uncertain and dangerous drug which might with advantage be omitted from the Pharmacopœia.

ASAFETIDA. *Asafetida*N.O. *Umbelliferae***Syn. I. V.**—*Hing*, Beng. *Hingra*, Hind., Bom.**Habitat.**—Afghanistan, the Punjab, Persia, and Turkistan.**Source.**—A gum-resin obtained by incision from the root of *Ferula foetida*.The fine quality is known as *kándáhári hing*. The common one as *hingra*.**Characters.**—In rounded or flattened, agglutinated, dull yellow tears, darkening on keeping. Internally yellowish, translucent, or milky-white opaque. Odour strong, persistent, alliaceous. Taste bitter, acrid, alliaceous. When triturated with water forms a white emulsion. Should contain not less than 65 p.c. of soluble matter in alcohol (90 p.c.). *Impurities.*—Earthy matter, flour, gypsum, and pieces of roots.**Identification.**—It resembles *Ammoniacum*, *Benzoin*, and *Gallbanum*, distinguishable by its strong characteristic alliaceous odour.**Composition.**—(1) *Volatile oil*, 5 p.c. containing essential oil of garlic, allyl persulphide which gives it its peculiar odour. (2) *Bassorin resin* 65 p.c. (3) *Gum* 25 p.c.**Action.**—Stimulant, antispasmodic. **B.P. Dose.**— 5 to 15 grs.**Enters into.**—Pil. Galbani Co. and the

OFFICIAL PREPARATIONS

1. *Pilula Aloes et Asafetidae*.—1 in 1. **B.P. Dose.**—4 to 8 grs.
2. *Spiritus Ammoniae Fetidus*.—33 grs. of *Asafetida* in 1 oz. **B.P. Dose.**—20 to 40 ms. for repeated use, and 60 to 90 ms. for a single dose.
3. *Tinctura Asafetidae*.—1 in 5. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.

PHARMACOLOGY

Externally.—*Asafetida* has a very feeble stimulating effect on the skin.**Internally. Gastro-intestinal canal.**—Like aromatic oils and resins, it is a **stimulant, carminative** and **antispasmodic**, expelling flatus and relieving spasm; but its unpleasant nauseous taste is a drawback to its use. In large doses it causes vomiting and purging. It is absorbed by the mucous membrane.**Lungs.**—Like onion it increases and disinfects the bronchial secretion during its elimination. Hence it is a **disinfectant expectorant**.**Nervous system.**—It **reflexly stimulates the nervous system** through the mouth and stomach.**Elimination.**—By the bronchial secretion and urine.

THERAPEUTICS

Externally.—A thick emulsion prepared by triturating with water is often applied with benefit by the writer, to the abdomen of infants in **tympanites**.

Internally.—It is rarely used now except in **hysteria** and **tympanites**. In the latter disease it may be given as an **enema** (30 grs. rubbed up with water 4 ozs.). Spt. ammon. fetid. is an excellent antispasmodic for **flatulent colic** of children or **hysterical flatulence** of young women. Cases of malingering may be cured sometimes by giving effervescing draughts containing a few minims of asafetida and valerian 3 or 4 times a day.

Prescribing hints.—It is best given in pills capsuled or varnished. If the tincture is prescribed, it should be suspended in mucilage.

ATROPINA. *Sec Belladonnæ Folia*

AURANTII CORTEX RECENS

Fresh Bitter Orange Peel. N.O. *Rutacea*

Syn. I. V.—*Kamlā nembur khosā*, Ben. *Narangi ke boklā*, Hindl.

Habitat.—Southern Europe, India, and Eastern Colonies.

Source.—The fresh outer part of the pericarp of *Citrus aurantium*, var. *Bigaradia*.

Characters.—Externally orange-red, rough, glandular. Inner surface whitish spongy. Odour pleasant, aromatic. Taste bitter.

OFFICIAL PREPARATIONS

1. **Syrupus Aromaticus.** *Syn.*—*Simple Elixir*. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.
2. **Syrupus Aurantii.**—1 in 8. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.
3. **Tinctura Aurantii.**—1 in 4. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr. *Enters into.*—Conf. Sulph., Syr. Aurant., Syr. Aromat., Syr. Cascar. Aromat., Tr. Quininae and Troch. Sulph.
4. **Vinum Aurantii.**—*Enters into.*—Vin. Quininae and Vin. Ferri Citratis.

AURANTII CORTEX SICCATUS

Dried Bitter Orange Peel

Source and Characters.—The dried outer pericarp of *Citrus aurantium*, var. *Bigaradia*, in thin strips.

Composition.—(1) *A fixed oil*, 1 to 2 p.c., which consists of a terpene, dextro-rotatory limonene. (2) Three *glucosides*—hesperidin, isohesperidin, aurantiummarin.

Enters into.—Inf. Gentian. Co., Spt. Armoracæ Co., Tr. Cinchon. Co. Tr. Gentianæ Co., and the

OFFICIAL PREPARATIONS

1. **Infusum Aurantii.**—1 in 20. **B.P. Dose.**— $\frac{1}{2}$ to 1 oz.
2. **Infusum Aurantii Compositum.**—1 in 40.
R.P. Dose.— $\frac{1}{2}$ to 1 oz.

AURANTII FLORIS AQUA

Orange-Flower Water

Source and Characters.—A commercial, colourless or greenish-yellow, fragrant water obtained by distilling the flowers of the bitter orange tree. To be diluted with twice its volume of distilled water before use.

Dose.—1 to 2 ozs.

OFFICIAL PREPARATION

1. **Syrupus Aurantii Floris.**—1 in 6½. **B.P. Dose.**—½ to 1 dr.

AURANTII CORTEX INDICUS

Indian Orange Peel

(Ind. and Col. Addendum)

Source.—The fresh and the dried outer part of the pericarp of varieties of *Citrus aurantium* grown in India and Ceylon.

In India and the Colonies this may be used for the same purposes as the fresh orange peel.

PHARMACOLOGY AND THERAPEUTICS

Externally.—Orange-flower water may be used as a vehicle for lotions. Neroli oil is used for perfuming hair-oils and pomades.

Internally.—The bitter orange peel is a feeble **bitter**, **stomachic** and **tonic**, and is generally used in combination with other bitters, such as gentian. The water is mainly used as a flavouring agent.

AZADIRACHTA INDICA

Indian Azadirach

N.O. Meliaceæ (Ind. and Col. Addendum)

Syn. B.P.—Neem Bark, Margosa Bark.

Habitat.—India and Eastern Colonies.

Source.—The dried bark of the stem of *Melia azadirachta*.

Characters.—Externally rusty-grey. Internally yellowish, foliated, fibrous. Taste bitter, slightly astringent. Inodorous.

Composition.—A **bitter principle** of a resinous nature is believed to be present in the inner bark.

OFFICIAL PREPARATIONS

1. **Infusum Azadirachtæ Indicæ.**—Bark 88 grs., Water 20 ozs. for 15 minutes. 1 in 100. **B.P. Dose.**—½ to 1 oz.

2. **Tinctura Azadirachtæ Indicæ.**—1 in 10. Bark 2 ozs., Alcohol (45 p.c.) 1 pint. By maceration. **B.P. Dose.**—½ to 1 dr.

PHARMACOLOGY AND THERAPEUTICS

Almost every part of the plant is used for medicinal purposes in India.

Externally.—The leaves in the form of a decoction or poultice are largely employed to **stimulate** foul and **indolent ulcers** to a healthier action. The decoction is also used as a local wash or a general bath in many skin diseases (see p. 65). Obstinate ulcers have been cured by neem-poultice. Weeping **eczema** quickly heals if a cold poultice of the bruised leaves is applied and allowed to remain on till it drops off. The leaves are said to prevent the ravages of white ants.

The oil extracted from the seeds is considered to be a valuable local **stimulant**, **antiseptic** and **insecticide**, and is often employed in **chronic rheumatism**, **chronic scrofulous ulcers** and many **scaly skin diseases**. Some consider it a valuable remedy for **itch**. Alone or in combination with chalmoogra oil or gurjun balsam, it is considered to be an effective application in **leprosy**.

Internally.—The bark is a **bitter tonic**, **astringent** and **antiperiodic**, the astringent properties residing in the outer layers. Before the introduction of quinine into this country, the bark either in powder (1 dr.) or in concentrated decoction, was largely employed by the natives to check ague. Its decoction is employed even now in many cases of malarious fevers where quinine fails to effect a cure, or as a tonic during convalescence. The root bark is said to possess **anthelmintic** properties.

The tree exudes a *gum* which is considered to be a stimulant and tonic, and a *saccharine sap* or toddy which is regarded as having refrigerant, stomachic and alterative properties. The fruits are said to be antiseptic, emollient, purgative and anthelmintic.

BALSAMUM PERUVIANUM

Balsam of Peru. N.O. *Leguminosæ*

Habitat.—Salvador in Central America.

Source.—A balsam exuded from the trunk of *Myroxylon pereiræ*.

Characters.—A blackish viscid liquid, in bulk reddish-brown, transparent in thin layers. Odour agreeable, balsamic. Taste acid. *Solubility.*—Insoluble in water, easily in chloroform, and 1 in 1 of alcohol (90 p.c.), but on addition of more alcohol the mixture becomes turbid. *Impurities.*—Copaiba, resins, castor oil, and other fatty oils, gurjun balsam, and ethylic alcohol.

Composition.—(1) A *volatile oil*, which consists of cinnamin, styracin, peruvian, styron, and benzoate of benzyl. (2) *Cinnamic acid*. (3) *Benzoic acid*. (4) *Resins*.

Action.—Stimulant, expectorant.

B.P. Dose.—5 to 15 ms. in emulsion with mucilage, or sugar and yolk of egg with water.

PHARMACOLOGY AND THERAPEUTICS

Externally.—On account of the volatile oil it contains, the balsam of Peru is an **antiseptic** and **stimulant** to the skin and abraded surfaces, and may be applied to **wounds**, **indolent ulcers**, **bed-sores**

&c. Mixed with vaseline (1 in 7) it cures **sore nipples** and **cracked lips**. The vapour of the volatile oil **kills pediculi**, and the **acarus scabiei**. It is a more agreeable remedy than the preparations of sulphur, and the method of application is the same (*see* Sulphur). It allays the itching of **urticaria** and **eczema**.

Internally.—Like most volatile oils, it is a **stimulant** and **carminative**. During its elimination by the bronchial mucous membrane it **stimulates** and **disinfects** the bronchial **secretion** and is therefore used as an **expectorant** in **chronic bronchitis**. It is also eliminated by the skin and kidneys, and sometimes helps to disinfect and lessen the discharge in **gleet**.

BALSAMUM TOLUTANUM

Balsam of Tolu. N.O. *Leguminosæ*

Habitat.—New Granada.

Source.—Obtained by making incisions in the trunk of *Myroxylon toluifera*.

Characters.—A soft, tenacious solid when first imported; hardens on keeping; brittle in cold weather; yellowish-brown and translucent in thin films. Odour fragrant. Taste aromatic, slightly acid. *Solubility*.—In alcohol (90 p.c.). *Impurities*.—Spurious articles not answering the B.P. test.

Composition.—(1) *Toluene*. (2) *Benzoic acid*. (3) *Cinnamic acid*. (4) *Tolu resinotannol*. (5) *Benzyl cinnamate*. (6) *Benzyl benzoate*. (7) *Vanillin*.

Action.—Expectorant.

B.P. Dose.—5 to 15 grs. in emulsion with mucilage, or yolk of egg, and sugar with water.

Enters into.—Tr. Benzoin Co. and the

OFFICIAL PREPARATIONS

1. **Syrupus Tolutanus**.—1 in 29. **B.P. Dose**.— $\frac{1}{2}$ to 1 dr.

Enters into.—Mist. Ammoniaci. Sweetens cough mixtures.

2. **Tinctura Tolutana**.—1 in 10. Bright reddish-brown. **B.P. Dose**.— $\frac{1}{2}$ to 1 dr. in emulsion.

Enters into.—Tolu basis for lozenges (*see* p. 57).

PHARMACOLOGY AND THERAPEUTICS

Internally.—Its actions resemble those of balsam of Peru. The syrup is used as a flavouring vehicle for cough mixtures. The tincture is a feeble **expectorant**.

BELÆ FRUCTUS. Bael Fruit

N.O. *Rutacæ* (*Ind. and Col. Addendum*)

Source.—The fresh half-ripe fruit of *Egle marmelos*.

Characters.—3 in. in diameter, ovoid or pyriform, smooth. 10 to 15 cells containing woolly seeds. Pulp juicy (?), hard, and brittle on drying. Taste mucilaginous, sweetish, astringent.

Composition.—(1) *Tannin*. (2) *Pectin*. (3) *Mucilaginous principles*. (4) *Sugar*, &c.

OFFICIAL PREPARATION

1. **Extractum Belsæ Liquidum.**—1 in 1. Bruised fruit 20 ozs. Water 15 pints, Alcohol (90 p.c.) *q.s.* By maceration and evaporation. **B.P.** Dose.—1 to 2 drs.

PHARMACOLOGY AND THERAPEUTICS

Internally.—The description of the actions of the bael fruit as given by English writers is inaccurate. The unripe fruit is an **astrigent**, while the ripe pulp is a gentle **stimulant** to the intestinal mucous membrane and an **aperient**. Occasionally, however, it causes constipation. The unripe pulp roasted or a decoction made from the unripe slices dried in the sun (*Bael suti*), possesses more astringent property than the fresh fruit and is therefore more effectual in **mucous diarrhoea** and **acute dysentery**. The compound or dietetic bael powder (powdered pulp 1, arrowroot 1) may be employed in the same class of cases. The ripe pulp is considered to be very serviceable in obstinate **catarrhal diarrhoea**, **chronic dysentery** and certain forms of **dyspepsia** characterised by alternate constipation and diarrhoea.

The root-bark of the plant is a mild febrifuge and enters into the composition of the "ten roots"—*dasha mula*—so frequently prescribed in mild fevers by the *Vaids* or practitioners of the Hindu system of medicine.

BELLADONNÆ FOLIA

Belladonna Leaves. N.O. *Solanaceæ*

Syn.—Deadly Nightshade Leaves, Dwale Leaves.

Habitat.—Britain.

Source.—The fresh leaves and branches of *Atropa belladonna*, collected when the plant is in flower.

Characters.—Leaves alternate below, in unequal pairs above, 3 to 8 in. long, broadly ovate, acute, entire, glabrous, short stalked. Corolla gamopetalous, campanulate, purple.

Identification.—They resemble *Stramonium Leaves*, which are more wrinkled; and *Hyoscyamus Leaves*, which are hairy.

Composition.—(1) *Hyoscyamine*, 0.5 to 0.9 p.c., is the natural alkaloid, which is converted into atropine.

Action.—Anhydrotic, antigalactagogue, anodyne, narcotic, deliriant, mydriatic. A powerful poison.

OFFICIAL PREPARATIONS

1. **Atropina.**—See p. 266.

2. **Extractum Belladonnæ Viride.**—Green. **B.P. Dose.**— $\frac{1}{4}$ to 1 gr.

3. **Succus Belladonnæ.**—Alkaloids 1 p.c. Brownish. **B.P. Dose.**—5 to 15 ms.

NON-OFFICIAL PREPARATIONS

1. **Ext. Bellad. Fol. Alcoholic. B.P.C.**—A soft extract used in the preparation of—

(a) **Colloidium Belladonnæ B.P.C.** *Syn.*—*Empl. Belladonnæ Fluidum.*—Alkaloids 44 grs. to 1 pint. An anodyne pigment drying quickly.

(b) **Empl. Bellad. Viride B.P.C.**—Alcoholic Extract of leaf *q.s.* containing alkaloids 11 grs., Resin Plaster *q.s.* to 10 ozs. *M.* Is half the strength of the B.P. plaster.

BELLADONNÆ RADIX. Belladonna Root

Source.—From *Atropa belladonna*, collected in the autumn and dried.

Characters.—In cylindrical pieces, entire or longitudinally split, $\frac{3}{4}$ to $\frac{1}{2}$ in. thick, 6 to 12 in. long, pale-brownish, and wrinkled longitudinally. Fracture short. Internally white, starchy, with no radiate appearance.

Identification.—It resembles *Pyrethrum*, which is unbranched, has a radiate fractured surface and causes a pricking sensation when chewed, and *scammony*, which is larger.

Composition.—The same as that of the leaves (*see above*).

OFFICIAL PREPARATIONS

1. **Atropina.**—*See below.*

2. **Emplastrum Belladonnæ.**—Alkaloids 0.5 p.c. Standardized, 2 in 3.

3. **Extractum Belladonnæ Alcoholicum.**—Standardized. Alkaloids 1 p.c. Dark semi-solid. **B.P. Dose.**— $\frac{1}{2}$ to 1 gr.

4. **Extractum Belladonnæ Liquidum.**—Alkaloids $\frac{3}{4}$ gr. in 110 ms. Standardized. A dark-brown liquid.

5. **Linimentum Belladonnæ.**—Alkaloids 0.38 p.c. Standardized. Yellowish-brown.

6. **Suppositoria Belladonnæ.**—Alkaloids $\frac{1}{16}$ gr. in each.

7. **Tinctura Belladonnæ.**—Standardized. $\frac{1}{16}$ gr. of alkaloids in 110 ms. **B.P. Dose.**—5 to 15 ms.; 1 m. for a child 1 year old.

8. **Unguentum Belladonnæ.**—Alkaloids 0.6 p.c. Standardized. Brownish.

NON-OFFICIAL PREPARATIONS

1. **Chloroformum Belladonnæ B.P.C.**—Prepared like (Chlorof. Aconiti (*see p. 207*)).

2. **Glycerinum Belladonnæ B.P.C.**—Extract 1 oz., Boiling Water 1 dr. Glycerin *q.s.* to 2 ozs. Rub with water in a warm mortar to produce a smooth paste and mix glycerin.

ATROPINA

Atropine. $C_{17}H_{23}NO_3$

Syn.—Atropia.

Source.—An alkaloid obtained from belladonna leaves and root.

As a conversion product, it may also be obtained from *Datura stramonium* and *Hyoscyamus niger*.

Characters.—In colourless, acicular crystals. **Solubility.**—1 in 300 of water, readily in alcohol (90 p.c.), chloroform and ether. The solution is *alkaline*.

Incompatibles.—Caustic alkalis decompose it and mercurial salt.

Action.—A virulent poison. A powerful anodyne and sedative.

B.P. Dose.— $\frac{1}{2}$ to $\frac{1}{10}$ gr. **Max. Dose.**— $\frac{1}{10}$ gr.

OFFICIAL PREPARATIONS

1. **Atropinæ Sulphas.**—*See below.*

2. **Unguentum Atropinæ.**—1 in 50. A local anodyne.

NON-OFFICIAL PREPARATIONS AND DERIVATIVES

1. **Oleatum Atropinæ.**—Atropine 5, Oleic Acid 200. Dissolve on a water-bath and mix. An anodyne pigment.

2. **Ung. Atropinæ cum Cocaina. L.O.H.**—Atropine 4 grs., Cocaine 8 grs., Soft Paraffin 1 oz. Mix by heat. In ophthalmic practice.

3. **Homatropine** and its salts.—Hydrochloride, hydrobromide (*off.*), and salicylate are quick local mydriatics. Their effects do not last long.

4. **Euphthalmine.** *Syn.*—*Hydrochloride of n-Methyl-vinyl-diactone-alkamine hydrochloride.*—A synthetic compound recently introduced to compete with the natural atropine. A 5 to 10 p.c. solution dilates the pupil like homatropine, but its effects are not so lasting. (Closely allied to B-Eucaine.

5. **Ephedrine Hydrochloride.**—The salt of an alkaloid obtained from *Ephedra vulgaris*. Shining white crystals, very soluble in water; 5 to 10 p.c. solution has mydriatic properties.

6. **Eumydrine.**—A derivative of atropine. A powerful mydriatic, but less poisonous. 1 to 2 p.c. solution dilates pupil in 25 minutes. No ill-effects. Dilatation lasts 12 hours.

7. **Mydrine.**—A mixture of Homatropine and Ephedrine in the proportion of 1 to 100. A 10 p.c. solution acts quickly, but it causes some burning sensation and the effects are transitory. Can be obtained in the form of "*Sterules.*"

ATROPINÆ SULPHAS. Atropine Sulphate



Source.—Obtained by neutralizing atropine with diluted sulphuric acid.

Characters.—In colourless crystals. **Solubility.**—1 m l of water, 1 m 10 of alcohol (90 p.c.). The solution is *neutral*.

Action.—Same as that of Atropine. **B.P. Dose.**— $\frac{1}{2}$ to $\frac{1}{10}$ gr. **Max Dose.**— $\frac{1}{10}$ gr.

OFFICIAL PREPARATIONS

1. **Lamellæ Atropinæ.**—Each contains $\frac{1}{1000}$ gr.

2. **Liquor Atropinæ Sulphatis.**—1 gr. in 110 ms. A colourless solution, which causes pain to the eye. **B.P. Dose.**— $\frac{1}{2}$ to 1 m.

HOMATROPINÆ HYDROBROMIDUM

Homatropine Hydrobromide. $C_{16}H_{21}NO_3HBr$

Syn. B.P. (Add. 1890).—Hydrobromate of Homatropine.

Source.—The hydrobromide of an alkaloid prepared from tropine.

Atropine splits up into tropic acid and tropine under the action of

barium hydrate. Tropine, combined with amygdalic acid and acted upon by diluted hydrochloric acid, forms *Homatropine*.

Characters.—A white crystalline powder or aggregation of minute trimetric crystals. **Solubility.**—1 in 6 of water, 1 in 8 of alcohol (90 p.c.).

Action.—Mydriatic. **B.P. Dose.**— $\frac{1}{80}$ to $\frac{1}{20}$ gr.

OFFICIAL PREPARATION

1. **Lamellæ Homatropinæ.**— $\frac{1}{100}$ gr. in each.

NON-OFFICIAL PREPARATION

1. **Oleum Homatrop. c. Cocaina.** **L.O.H.**—Homatropine (pure) 10 grs., Cocaine (alkaloid) 10 grs., Castor Oil 1 oz. Dissolve by heat.

PHARMACOLOGY

Externally.—The unbroken skin absorbs the alkaloids of belladonna if combined with alcohol, chloroform, glycerin or fat. Exposed mucous surfaces and raw skin absorb them more rapidly. Both belladonna and atropine powerfully paralyse the peripheral terminations of the sensory nerves, especially if there is pain, and are therefore **local anæsthetics** and **anodynes**. To a much less extent they paralyse the termination of the motor and secretory nerve-endings, e.g. the nerves of the sweat and milk glands. Hence they are **local anhydrotics** and **antigalactagogues**. The blood-vessels of the part first contract and then dilate.

Internally.—Atropine readily enters the blood and circulates unaltered without affecting the blood corpuscles. It chiefly affects the nervous system: other organs and tissues are indirectly influenced through its action on their special or secretory nerves. Therefore we will first notice its actions on the nervous system proper and afterwards on other organs of the body.

Nervous system.—The action of belladonna on the nervous system is most important, as through its agency all other actions in the body are performed.

1. **Cerebrum.**—In medicinal doses belladonna scarcely produces any effect on the convolutions, but in large doses it is a **deliriant**, causing incoherent delirium and constant desire to move about, disordered vision, and insensibility. No true **coma** even after large doses. The quietude which follows the delirium is merely the result of nervous exhaustion.

2. **Medulla and cord.**—Two chief centres are powerfully affected by belladonna, viz., (a) the **respiratory** and (b) the **vaso-motor**. The vagal centre is affected to a much less extent. It also slightly increases then diminishes the **reflex excitability**. It causes tetanus in frogs, but not in man.

3. **Sensory nerves.**—Belladonna, whether locally applied or given by the mouth, paralyse the peripheral terminations of the **sensory nerves** and thereby relieves pain if present. It is therefore a **local**

and **general anodyne**. Its action is not so powerful as that of atropine. As a general anodyne atropine is inferior to morphine.

4. *Motor nerves and voluntary muscles*.—The motor nerves are slightly paralysed towards the end, but the voluntary muscles are never affected.

5. *Splanchnics and intestine*.—Small doses paralyse the **inhibitory fibres of the splanchnics supplying the intestinal walls** and thus increase peristalsis and cause relaxation of the bowels (*see* p. 128). Large doses arrest peristaltic movements, but the muscular coat retains its irritability. The sensory and vaso-motor fibres are not affected.

6. *Nerves of the bladder, urethra, uterus, &c.*—The terminations of the nerves supplying the involuntary muscles of the bladder, urethra, ureter, vesiculae seminales, uterus and vagina are paralysed.

7. *Third nerve in the eye*.—Atropine dilates the pupil whether locally applied or given by the mouth. This is due to **paralysis of the terminations of the third nerve** in the iris. The muscular fibres of the iris are not affected at first as contraction of the pupil occurs if the muscle itself be stimulated. That there is paralysis of the muscular fibres themselves when the dose is large is shown by the fact that direct stimulation no longer produces contraction. It also paralyses the termination of the same nerve in the ciliary muscle. Hence, it is a powerful **local and remote mydriatic and paralysar of accommodation** (*see* p. 161). So powerful are the local effects of atropine on the eye, that it can dilate the pupil in a recently excised eye, and also that of an eye the third nerve of which has been divided. As the pupil dilates of itself after division of the third nerve, the further dilatation of such a dilated pupil after the application of atropine must be due to the stimulation of the sympathetic fibres in the iris. In large doses it **increases intra-ocular tension**. The action of atropine on the eye is not central but direct.

8. *Vagal ends in the heart*.—The vagus is the inhibitory nerve of the heart. Belladonna **stimulates the endings of the vagus** in the heart, causing slowing of the pulse, but this is quickly followed by paralysis rendering the **pulse-beat more rapid**. This rapidity cannot be diminished by stimulating the vagus. At times the excitement becomes so strong that the heart-sounds may be heard a few feet from the patient. With the acceleration of the pulse, belladonna **does not reduce the force and tone of the heart**. According to some authorities, the frequency of the pulse is to some extent also due to slight stimulation of the cardiac accelerator nerves. The vagal centre and trunk are also slightly paralysed, and the primary slowing of the pulse, according to some authorities, may be due to the excitation of this centre. In toxic doses the heart is paralysed and stops in diastole.

9. *Vagal ends in the bronchial walls*.—Both the **afferent and efferent terminal ends of the filaments of the vagus** are paralysed after a brief stimulation, producing **relaxation** of the muscular coat of the tubes, and diminishing the **sensibility and reflex action** (paralysis

of the afferent fibres). Thus belladonna is a **bronchial antispasmodic**. It also diminishes the bronchial secretion.

The **respiration** becomes **quicker** and **deeper** by the stimulation of the medullary and spinal respiratory centres, but large doses paralyse it and make it **shallow** and **slow**.

10. *Vaso-motor nerves and the skin*.—Like its action on the vagal centre, belladonna in full doses first **stimulates** then **paralyses** the vaso-motor centre in the medulla. As a result of this, the peripheral blood-vessels first **contract** and then **widely dilate**. During this period of contraction, the **blood-pressure rises considerably**. This is also greatly helped by the simultaneous acceleration of the heart's action from the paralysis of the cardiac vagal terminations. With the dilatation of the blood-vessels, the **blood-pressure falls**. The spinal vaso-motor centres are only brought into action when the heart is paralysed and the blood-pressure is extremely low. The **flushing or scarlatiniform or erythematous rash** on the skin so often seen in belladonna poisoning is no doubt due to the dilatation of the peripheral blood-vessels.

11. *Secretory nerves*.—Atropine is a powerful **paralyser of almost all the secretory nerve-endings** in the body, thereby exercising a most powerful depressant influence on the secretions of most of the secretory organs. Its actions on these organs are given below :—

(a) *Salivary and mucous glands*.—Even in small doses atropine powerfully **paralyses the terminations of the secretory fibres of the chorda tympani**, but not the vaso-dilator ones, so that stimulation of the chorda tympani does not stimulate the flow of saliva from the submaxillary gland though its vascularity is increased. Stimulation of the sympathetic still induces secretion, this shows that although the secreting nerves are paralysed the secreting cells are not influenced in any way. It also depresses the terminations of the secretory nerves of the salivary and mucous glands. Consequently, the mouth, palate and throat become dry and red. After large doses the dryness increases so much that deglutition becomes impossible. Hence atropine is a powerful **antisialagogue** (see p. 122).

(b) *Gastro-intestinal glands*.—Recent researches go to prove that atropine greatly lessens the percentage of HCl secreted by the stomach, without very much affecting the secretion of pepsin. But after prolonged use the gastric glands cease to respond to it.

(c) *Liver and pancreas*.—According to Brunton and others, their secretions are diminished.

(d) *Bronchial glands*.—The secretion of the bronchial and tracheal mucus is very much diminished.

(e) *Sweat-glands*.—Whether locally applied or given by the mouth atropine powerfully checks sweating. This it does by paralysing the terminations of the secreting nerves. It is therefore a **local and general anhydrotic**.

(f) *Mammary glands*.—In the same manner the secretion of milk is also arrested. Hence it is a **local and remote antigalactagogue**.

(g) *Lachrymal glands*.—Prolonged use of atropine arrests their secretion.

(h) *Kidneys*.—Here its action is uncertain. Sometimes it causes **diuresis**. Large doses cause retention of urine as the result of paralysis of the bladder.

Temperature.—Belladonna in toxic doses raises the temperature of the body by 3 or 4 degrees. Hence it is a true **caloricrescent**. As the circulation fails, the temperature falls.

Elimination.—Atropine is excreted unaltered by the urine within 10 to 20 hours. It increases urea, phosphates, sulphates, but not chlorides in the urine.

Toleration.—Children can bear large doses of belladonna (*see* p. 117). Old people bear it badly. Pigeons and rodents are insusceptible to it.

Summary of actions.—(1) Atropine paralyses the terminal ends of (a) the sensory, (b) the secretory and (c) the third nerve. (2) It is a deliriant. (3) It first stimulates and then depresses the three **vital centres**—(a) respiratory, (b) vagal and (c) vaso-motor. (4) It paralyses the inhibitory fibres of the splanchnics. (5) Causes flushing of the skin and increase of temperature.

Methyl and Ethyl Atropines do not cause tetanus in frogs and paralyse the motor ends, but they act like atropine on the eye, heart, &c.

Acute toxic action.—The symptoms that follow a moderate dose of atropine are dryness of the mouth and throat with difficulty of swallowing, dilatation of pupils, confused vision, dry skin, and slow pulse. Larger doses bring on these symptoms more quickly. The face, conjunctiva and skin are flushed, the pulse becomes frequent, sometimes doubled. The patient feels giddy, staggers, and is delirious. The skin becomes hot, uniformly red or erythematous; pupils widely dilated; bowels relaxed; micturition difficult and painful; respiration slow and deep; unconsciousness alternating with delirium and death from cardiac paralysis combined with asphyxia. At the *post-mortem* all organs are in a state of venous congestion due to asphyxia.

The symptoms of poisoning have been observed after the application of plaster, glycerin of belladonna, or liniment.

Antidotes.—Emetics or pump. Tannin, tea, charcoal. Morphine, caffeine, or pilocarpine hypodermically. Physostigmine and chloral hydrate are also recommended. Stimulants, hot bottles, artificial respiration. As the poison is eliminated by the urine, the bladder is to be emptied now and then by the catheter to prevent reabsorption.

Physiological antagonists.—Morphine, pilocarpine, physostigmine, aconitine, chloral hydrate, hydrocyanic acid, muscarine, &c. Of these the first three are the most powerful.

THERAPEUTICS

Externally. Skin.—As a local *anodyne*, belladonna in the form of liniment, plaster or ointment is largely employed to soothe irritability

or pain in **neuralgia**—especially intercostal and supra-orbital, **soreness of muscles**, as of the chest in **phthisis**, **pleurodynia**, **hyper-sensibility** and **pruritus** of the skin, **acute gout** and **rheumatism**, &c. Chloroformum Belladonnæ B.P.C., Ung. Atropinæ or Oleat. Atropinæ are most powerful in this respect. Occasionally atropine injected subcutaneously as near the nerve as possible does more good in neuralgia, especially in **sciatica**, than any local applications. As an **anodyne** and **antiphlogistic**, Glycerinum Belladon. or Collodium Belladonnæ may be used in **boils**, **threatening abscesses**, **carbuncles**, **ovaritis**, **orchitis**, **erysipelas**, **pelvic cellulitis**, &c. Liniment of belladonna rubbed in three or four times a day, or a hypodermic injection of atropine in obstinate cases, checks **local sweating**. In the form of an ointment either alone or better still with conium, belladonna lessens the spasm of **anal fissure** and the pain and irritation of **piles**.

Female diseases.—As an **antigalactagogue** or **antiphlogistic**, belladonna is very useful in stopping the secretion of milk, or in subduing the inflammation of the breast of the mother, who for some reason or other is unable to nurse her child. For this purpose the liniment will be found the cleanest application. Belladonna plasters are very messy and soil the patient's linen. In this connection Jellett ("Manual of Midwifery") as the result of his experience at the Rotunda Hospital, maintains that the application of an ointment consisting of one part of yellow wax and eight parts of olive oil is just as efficacious as an anti-galactagogue and far safer for general use. Extract of belladonna with glycerin (5 to 10 grs. to 1 oz.) in cotton-wool may be used as a pessary in **inflammation of the womb** or **cervix**. A pessary containing alcoholic extract 2 grs., tannic acid 7 grs., and cacao-butter *q.s.* is very serviceable in **leucorrhœa** with **ulcerated os**. A suppository containing alcoholic extract 1 gr. is an excellent application to relieve the pain of spasmodic and neuralgic **dysmenorrhœa**.

Eye.—A solution of atropine is dropped into the eye to dilate the pupil and paralyse the accommodation in many conditions already noticed in page 161. Where only temporary mydriasis is required, as in estimating errors of refraction, homatropine should be used in preference to atropine as the effects pass off more quickly and there is less likelihood of toxic effects from absorption. Euphthalmine is also useful for the same purpose, and it has the advantage of not irritating the conjunctiva.

Internally. Alimentary canal.—Atropine sometimes checks **mercurial salivation**. In small doses, frequently repeated, alone or in combination with aconite, belladonna (Tr.) checks **acute tonsillitis**. The extract is often combined with purgatives either to increase their activity or lessen griping. As an indirect **aperient** in very minute doses it may be given in **habitual** or **chronic constipation** and **painful defæcation**. In **obstinate constipation** Trousseau recom-

containing 1 or 2 grs. of the extract often causes an easy motion when strong purgatives have failed.

Alone or with opium, the alcoholic extract is very effective in **intestinal obstruction**, **peritonitis**, **enteritis** and **appendicitis**. It also relieves the pain of **biliary**, **intestinal** and **lead colics** by paralyzing the sensory nerve-terminations and relaxing the involuntary muscular fibres.

Heart and circulation.—Belladonna relieves palpitation, pain and distress of the heart. For this purpose a plaster is often applied over the cardiac region. As it increases the action of the heart without lowering its force and relaxes the arterioles, it is of immense value in those cases where we want to empty the ventricles completely, as in **angina**. In cases where a patient with a weak heart is to be placed under chloroform, atropine may be injected subcutaneously as a preliminary precaution.

Respiratory tract.—Belladonna is extremely useful in many spasmodic affections of the air-passages, such as **asthma**, **spasmodic bronchitis** and **whooping cough**. The writer uses with great benefit the subcutaneous injection of atropine in spasmodic asthma. In whooping cough it must be given freely before we may expect any decided improvement. In **nasal catarrh** with profuse discharge atropine gives immediate relief. Hausmann recommends its hypodermic injection ($\frac{1}{10}$ gr.) in **hæmoptysis** when ergot fails.

Skin.—Atropine (1 to 2 ms. of the solution, or $\frac{1}{100}$ gr. hypodermically) arrests **excessive sweating**. It is therefore an excellent remedy for **night-sweats** of **phthisis**. Extract of Belladonna acts equally well, especially when combined with zinc oxide.

Nervous system.—Belladonna is now rarely used in nervous diseases. It may be given in **frontal headache** and **sciatica** and is said to control **delirium** in fevers. Trousseau recommends atropine in **delirium tremens**. He says that a single hypodermic injection of $\frac{1}{4}$ gr. sometimes calms delirium and brings on a refreshing sleep.

Genito-urinary tract.—It may be of great use in **incontinence of urine** in children. It may stop **nocturnal emissions** in persons whose genitals are weak and relaxed, and when discharge takes place without dream or orgasm. But extract of hyoscyamus and camphor are better for this purpose. It is very useful in allaying the pain and helping the expulsion of **renal calculi**, but in order to obtain these effects it must be given in large doses until toxic action is produced (W. Murray). **Cystitis**, **dysuria**, **urethral spasms** and, in fact, any kind of pain in the pelvic organs can be removed by belladonna either administered in the form of a suppository or by the mouth.

Antidote to poisons.—Atropine may be successfully used as a physiological antidote in poisoning by morphine, physostigmine, chloroform, aconite, poisonous mushrooms (muscarine), nitroglycerin, picrocarpine, gelsemium and hydrocyanic acid.

Prescribing hints.—A porous belladonna plaster is the best to use as it causes less itching and irritation. For application to the female breast, it should be shaped as directed on page 95 or cut in two or three places so as to fit it. Collodion belladonna may be painted over an uneven surface in its stead. Atropine may be given in tablet-, pills or in solution. Hypodermically it is often combined with morphine to counteract its unpleasant physiological effects and to increase its sedative virtue. 10 ms. of the tincture every 4 hours to young children for *whooping cough*; and 30 to 40 ms. of the same every 1 or 2 hours during an *attack of renal colic* until atropism—dryness of the throat, dilatation of the pupils and delirium—sets in are not unsafe to use in those particular cases. Caustic fixed alkalis destroy the alkaloids of belladonna, but carbonates and bicarbonates of sodium and potassium do not do so.

Homatropine hydrobromide may be applied either in solution (4 grs. in 1 oz. of water), or as a disc, or dissolved in castor oil with cocaine. The object of mixing it with castor oil is to prevent it from being washed away by the tears.

BENZOINUM. Benzoin

N.O. *Styraceæ*

Syn.—Gum Benjamin. **Syn. I. V.**—*Lobán*.

Habitat.—Siam and Sumatra.

Source.—A balsamic resin obtained from *Styrax benzoin* and other species of *Styrax*. Commercially known as Siam and Sumatra benzoin.

Characters.—*Siam benzoin*.—In flat or curved reddish-brown tears 2 in. long, $\frac{1}{2}$ in. thick; milk-white internally. *Sumatra benzoin*.—In masses of agglutinated tears, having a white and reddish-brown marbled or mottled or granite-like appearance. Brittle, softens when warm and yields fumes of benzoic acid when heated. Odour agreeable, like vanilla in the case of Siam, and like storax in the case of Sumatra benzoin. *Solubility*.—In alcohol (90 p.c.) and solution of potassium hydroxide.

Identification.—See *Ammoniacum*, p. 230.

Composition.—(1) *Benzoic acid* 12 to 20 p.c. (2) *Cinnamic acid* a trace (3) *Volatile Oil*. (4) *Resins*.

Action.—Expectorant, diuretic.

Enters into.—Adep. Benzoat., Ung. Cetacei, and the

OFFICIAL PREPARATION

1. **Tinctura Benzoini Composita.** *Syn.*—*Friar's balsam*. **B.P.** Dose.— $\frac{1}{2}$ to 1 dr.

NON-OFFICIAL PREPARATIONS

1. **Tr. Benzoini Simplex, B.P.C.**—Benzoin 2, Alcohol (90 p.c.) q.s. 15) maceration to 20.

2. **Ung. Benzoini.**—Benzoin 1, Adeps 4. *In chronic ulcers.*

3. **Vapor Benzoini.**—1 dr. in 1 pint at 140° F. A soothing sedative in bronchial irritation.

ACIDUM BENZOICUM

Benzoic Acid. C_6H_5COOH

Source.—Obtained from benzoin by sublimation. Also from toluene, hippuric acid, and other organic compounds. In commerce we find four varieties:—(1) *Resin Suolimed Acid*, (2) *Resin Precipitated Acid*, (3) *Hippuric Benzoic Acid*, and (4) *Toluene Benzoic Acid*.

Characters.—In light, feathery, colourless, and odourless crystalline plates or needles. **Solubility.**—1 in 400 of cold, 1 in 17 of boiling water, 1 in 3 of alcohol (90 p.c.), 1 in 7 of chloroform, and in fixed and volatile oils, also in the solutions of alkalis and of calcium hydroxide. Sodium phosphate or borax aids solubility in water. Volatilizes in the vapour of water. **Impurities.**—Hippuric, cinnamic, oxalic, and chloro-benzoic acids.

Action.—Antiseptic, stimulating expectorant, diuretic.

Incompatibles.—Ferrie salts and mercuric chloride.

B.P. Dose.—5 to 15 grs.

Enters into.—Tr. Camph. Co., Tr. Opi Ammoniata, and the

OFFICIAL PREPARATION

- 1 **Trochiscus Acidi Benzoici.**— $\frac{1}{2}$ gr. in each. *Dose.*—1 to 5.

AMMONII BENZOAS

Ammonium Benzoate. $C_6H_5COONH_4$

Source and Characters.—Colourless laminar crystals, prepared by neutralizing solution of ammonia with benzoic acid. **Solubility.**—1 in 6 of cold water, 1 in 30 of alcohol (90 p.c.), and 1 in 8 of glycerin. **Impurities.**—Free acid, sulphates, and chlorides.

Incompatibles.—Ferrie salts, acids, liq. potassæ.

Action.—Diuretic. **B.P. Dose.**—5 to 15 grs. in solution.

SODII BENZOAS

Sodium Benzoate. C_6H_5COONa

Source and Characters.—A white, inodorous, amorphous, or crystalline powder with a faint benzoic odour; prepared by neutralizing benzoic acid with sodium carbonate. **Solubility.**—1 in 2 of water, 1 in 24 of alcohol (90 p.c.). **Impurities.**—Many metals and salts.

Action.—A powerful hepatic stimulant and diuretic.

B.P. Dose.—5 to 30 grs. in solution.

NON-OFFICIAL DERIVATIVES OF BENZOIC ACID

1 **Potassii Benzoas.**—A soluble, crystalline salt. In lithic acid diathesis, *cystitis*. *Dose.*—15 to 30 grs.

2 **Sodii Hippuras.**—A soluble white amorphous powder. A solvent of urates in *gout* and *gravel*. *Dose.*—5 to 30 grs.

3 **Calcii Hippuras.**—Shining white crystals. *Dose.*—5 to 20 grs.

4 **Pyrenol.** *Syn.*—Benzoyl - thymol - sodium oxybenzoate.—Aromatic white hygroscopic crystalline powder. In small doses said to improve chronic *rheumatism*. Large doses increase diaphoresis in pleurisy and decrease the effusion. Antipyretic and antineuralgic. *Dose.*—8 to 30 grs.

PHARMACOLOGY OF BENZOIN AND BENZOIC ACID

Externally.—Both benzoïn and benzoic acid are **antiseptics**, superior to carbolic and salicylic acids. A concentrated solution is a **local stimulant and irritant**.

Internally. Gastro-intestinal canal and liver.—The salts are less irritant and are therefore used in preference to the acid. In small doses they have little effect on the stomach and intestine, but in large doses **irritate** them. They are **hepatic stimulants** increasing both the quantity and solids of the bile. The acid is an **intestinal disinfectant**.

Respiratory tract.—Both the gum and acid cause sneezing when inhaled. Their vapour directly stimulates the bronchial secretion which is also remotely stimulated during their excretion when given by the mouth. Hence they are **stimulant expectorants**. They also disinfect the secretion.

† **Urinary tract.**—Benzoic acid and its salts are largely excreted with the urine, partly unchanged, but chiefly as **hippuric acid**. Occasionally, succinic acid also appears in the urine. The appearance of hippuric acid in the urine is due to the decomposition of benzoic acid in the presence of glycocoll in the renal cells but not in the blood; thus— $C_7H_6O_2$ (benzoic acid) + $C_2H_5NO_2$ (glycocoll) \rightarrow $C_9H_9NO_3$ (hippuric acid) + H_2O . The origin of glycocoll is not known, but the fact of the conversion of the benzoic acid taking place in the kidneys is proved by the following experiments:—(1) If benzoic acid is given in large doses, it is found unchanged in the blood, and if the renal arteries are tied no hippuric acid is generated, though it is formed if the ureters are tied. (2) Benzoic acid is converted into hippuric acid if the blood containing the former but no glycocoll is slowly passed through the kidneys immediately removed after death. (3) When hippuric acid is given by the mouth, benzoic acid is detected in the blood and hippuric acid in the urine. Hippuric acid thus formed performs most important functions. It **stimulates the activity of the renal cells** and **renders the alkaline urine acid**. Hence benzoic acid and benzoates are **diuretics** and **acidifiers** of alkaline urine. It is said that the conversion to hippuric acid does not occur in diseased kidneys. Over the mucous membrane of the urinary tract they have a soothing, disinfecting and alterative influence.

Temperature.—Benzoic acid and benzoates are **antipyretics**, sometimes acting more powerfully than salicylic acid, but how they act is not known.

Metabolism.—They are believed to increase tissue metamorphosis. Sodium benzoate is believed to increase the nitrogenous constituents of urine, and the body weight falls.

Elimination.—Chiefly with the urine, and partly with the sweat, saliva and bronchial secretion, which are stimulated to a slight extent.

THERAPEUTICS

Externally.—A piece of lint soaked in Friar's balsam may be used to stop bleeding from, and promote the healing of, **fresh wounds**. In the same manner it may be used as an effective dressing for **ulcers** of all sorts. Undiluted Friar's balsam injected into **sinuses** establishes a healthier action in these tracts and heals them quickly. Locally applied, it relieves the pruritus of **urticaria**, and in solution (5 p.c. of the compound tincture with 5 p.c. of glycerin in 1 oz. of water) it is a soothing stimulant application for the skin after the cure of **acne**. Benzoin is mixed with lard to prevent its decomposition, but it occasionally causes irritation of the skin.

Internally. Lungs.—Both benzoin and benzoates are largely employed either by the mouth or as an inhalation, in chronic **bronchitis** and **phthisis**, particularly if the expectoration is foul and scanty. The vapour of the tincture has been found to cut short, with surprising rapidity, attacks of **catarrh** and **influenza**.

Urinary tract.—As an *acidifier* of alkaline, decomposing urine in **cystitis**, **pyelitis** or **phosphatic calculi**, benzoic acid and benzoates are most valuable. The salts should be used in preference to the acid, as they cause less gastro-intestinal irritation. They may be combined with urinary sedatives, such as Tinct. Hyoseyami.

Rheumatism and gout.—Benzoic acid may be given in **acute rheumatism** when salicylate of sodium cannot be borne or fails to do good. In **gout** it is occasionally used with the idea that it converts uric acid into hippuric acid and thus helps its elimination.

Prescribing hints.—The acid may be given in cachets, pills, or mixtures suspended by mucilage. Chloroform disguises its taste. The vapour may be inhaled through an inhaler or even directly from a bottle.

BENZOL. Benzol

Source.—A mixture of homologous hydrocarbons obtained from light coal-tar oil. It contains about 70 p.c. of benzene C_6H_6 , and 20 to 30 p.c. of toluene $C_6H_5CH_3$.

Characters.—A colourless, volatile liquid; odour strong, characteristic. Sp. gr. 0.880 to 0.888.

Dose.—5 to 10 m. in capsule or oily solution.

PHARMACOLOGY AND THERAPEUTICS

It has been used internally for **whooping cough** and in **influenza**. It quickly destroys **pediculi capitis** or **pubis**; one application usually is sufficient. Also used in **seborrhœa** and **scabies**. Used in Pharmacy as solvent for India-rubber.

BERBERIS. Berberis

N.O. *Berberidaceæ*. (*Ind. and Col. Addendum.*)

Syn. I. V.—*Dáruharidrâ kâshâ*, Beng. *Dárhald*, *chatra*, *Hind.*

Habitat.—India and Eastern Colonies.

Source.—The dried stem of *Berberis aristata*.

Characters.—Undulating pieces 1 to 2 in. thick, covered with orange-brown periderm. Bright yellow. Odour faint. Taste bitter.

Composition.—Two alkaloids: (1) *Berberine* and (2) *Oxyanthine*.

OFFICIAL PREPARATIONS

1. **Liquor Berberidis Concentratus.**—Berberis 10 ozs., Alcohol (20 p.c.) 25 ozs. or *q.s.* By percolation to 1 pint. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.

2. **Tinctura Berberidis.**—Berberis 2 ozs., Alcohol (60 p.c.) *q.s.* By percolation to 1 pint. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.

NON-OFFICIAL PREPARATIONS

1. **Ext. Berberidis.**—An impure watery extract from the wood and bark of several species of *Berberis* sold in the Indian bazaars under the name of **Rasot**, which can be purified by dissolving it in alcohol (90 p.c.) and evaporating it to a pilular consistence. *Dose.*—30 to 60 grs.

2. **Inf. Berberidis.**—1 in 20 of boiling water for 1 hour. *Dose.*—1 to 2 ozs.

3. **Berberine Carbonate, Hydrochloride, Phosphate, and Sulphate** are yellow crystals more or less soluble in water. *Dose.*—1 to 5 grs.

PHARMACOLOGY AND THERAPEUTICS

Externally.—Being a mild **local astringent Rasot** is often employed by the natives of India with benefit as a pigment around the eyes in acute and chronic **ophthalmia**. It is often combined with alum and opium.

Internally.—Berberis is a mild **astringent, bitter tonic and stomachic** in small doses, and **diaphoretic, antipyretic, antiperiodic** and a gentle but certain **aperient** in large doses. It is chiefly used in fevers. Its diaphoretic and antipyretic properties, according to some authorities, are equal to those of quinine and Warburg's tincture. Dr. W. B. O'Shaughnessy speaks very highly of **Rasot** in **intermittent fever**. He says that "in no instance was headache or constipation produced, but we have seen **Rasot** exasperate the symptoms of chronic dysentery and hepatitis when combined with **ague**." As an alterative tonic, Berberis may be used in **scrofulous** and **syphilitic diseases**, and as an astringent, tonic and alterative in **chronic intestinal catarrh**. It checks the vomiting of pregnancy.

BETEL. Betel

N.O. *Piperaceæ* (Ind. and Col. Addendum)

Syn. I. V.—*Pân*, Beng. *Pân, tambuli*, Hind.

Habitat.—India and Eastern Colonies.

Source.—The leaves of *Piper betel*.

Characters.—Broadly ovate, acuminate, obliquely cordate at base, glossy on upper surface. Taste warm, aromatic, bitter.

Composition.—(1) Two **Aromatic Oils**, light and heavy, which treated with caustic potash yields **chavicol**, a phenol having powerful antiseptic properties. (2) An alkaloid, **arakene**, with properties somewhat allied to

cocaine. The characteristic odour of the leaves and oil is due to "betel-phenol."

PHARMACOLOGY

Externally.—Dry betel-leaf has no action. Fresh betel-leaf is a gentle **stimulant** to the skin, due no doubt to the volatile oils it contains.

Internally.—When chewed the fresh leaf is a mild, aromatic **sialagogue**, allaying thirst and dryness of the mouth. It also removes foulness of the breath. The juice stimulates the gastric vessels and nerves and thus acts as a **stomachic** and **carminative**. It is said to possess mild **astringent** and **expectorant** virtues. The warm juice is considered a **febrifuge**. Too much chewing of pan blunts hunger, probably because of the presence of alkaloid arakene. If taken in excess it may cause intoxication somewhat similar to that of alcohol.

THERAPEUTICS

Externally.—As an easily available domestic remedy, betel-leaf is used for various purposes. Smearcd with mustard oil or *chunam* (hydrated slaked lime) and warmed, it is applied to the temples in **headache**, to the neck in **sore throat**, to **swollen glands** to promote their absorption and to the breasts to check the secretion of milk. The writer applies the juice mixed with *chunam* (2 to 1) and warmed in these cases with good results. In catarrhal and pulmonary affections of children, the leaves smeared with oil and warmed are applied in layers to the chest, relieving both cough and dyspnoea. The leaves may be similarly employed in **hepatitis**, **orchitis**, **ovaritis**, &c. The Bengal betel leaves are most valuable in these cases. They are used as dressings for foul ulcers or as substitutes for oiled silk or gutta-percha tissue. The juice is sometimes dropped into the eye in **ophthalmia** or into the ear (warmed) to relieve **earache**. The stalk of the leaf smeared with oil is introduced into the rectum in **constipation** and flatulence of children.

Internally.—The natives of India chew prepared *pan* which is made by wrapping slices of areca nut with a proportionate quantity of catechu, *chunam* and spices in betel leaves. This combination is very efficacious in **ulcerated** and **spongy gums**, and as a digestive adjuvant in **dyspepsia**. Prepared *pan* is an excellent masticatory for removing the after-taste of bitter and nauseous drugs, and dryness of the mouth in Bright's disease and diabetes. The juice may be given as an expectorant in colds and coughs or as a febrifuge in the **catarrhal fever** of children.

BISMUTHI CARBONAS

Bismuth Oxycarbonate. $(\text{Bi}_2\text{O}_2\text{CO}_3)_2, \text{H}_2\text{O}$

Source.—May be prepared by the interaction of bismuth nitrate and ammonium carbonate (Bismuth nitrate is not official).

Characters.—A heavy whitish powder insoluble in water, soluble in nitric acid and water. **Impurities.**—The same as those of the subnitrate.

Action.—Antacid, gastric, sedative. **B.P. Dose.**—5 to 20 grs.

OFFICIAL PREPARATION

1. **Trochiscus Bismuthi Compositus.**—*Dose.*—1 to 6.

BISMUTHI OXIDUM

Bismuth Oxide. Bi_2O_3

Source.—Prepared by boiling bi-muth oxynitrate with solution of sodium hydroxide, $2\text{BiONO}_3 + 2\text{NaHO} = \text{Bi}_2\text{O}_3 + 2\text{NaNO}_3 + \text{H}_2\text{O}$.

Characters.—A slightly brownish yellow powder insoluble in water, but soluble in nitric acid mixed with half the volume of water. *Impurities.*—The same as those of the subnitrate.

Action.—Similar to the subnitrate. **B.P. Dose.**—5 to 20 grs.

NON-OFFICIAL PREPARATIONS

1. **Bismuthi Oxidum Hydratum.**—A white amorphous powder which mixes readily with water to form **Bismuth Cream** (1 in 4).

2. **Ung. Bismuthi Oxidum.** Bismuth Oxide 1, Oleic Acid 8, White Wax 3, Soft Paraffin 9. Mix by the aid of heat.

BISMUTHI SALICYLAS

Bismuth Salicylate. $(\text{C}_6\text{H}_4\text{OH}\cdot\text{COO})_2\text{BiO}$

Source.—May be prepared by the interaction of bismuth nitrate and sodium salicylate.

Characters.—A white, heavy, amorphous powder insoluble in water and alcohol (90 p.c.). *Impurities.*—The same as those of the bismuth subnitrate.

Action.—Gastro-intestinal sedative, antieptic.

B.P. Dose.—5 to 20 grs.

NON-OFFICIAL DERIVATIVES

1. **Bismuthi et Cerii Salicylas.**—A double salt useful in *sea-sickness*, *diarrhoea*, *dysentery* and *ulcerated bowels*. *Dose.*—5 to 20 grs.

2. **Thioform.** *Syn.*—*Basic Dithio Salicylate of Bismuth.*—An antiseptic, desiccant.

BISMUTHI SUBNITRAS

Bismuth Oxynitrate. $\text{BiONO}_3\cdot\text{H}_2\text{O}$

Source.—Prepared by the interaction of bismuth nitrate and water, $(\text{BiONO}_3) + \text{H}_2\text{O} = (\text{BiONO}_3) + 2\text{HNO}_3$

Characters.—A heavy, white, odorless powder consisting of minute crystalline scales; reaction slightly acid. *Solubility.*—Insoluble in water. *Impurities.*—Nitrates, chlorides, tellurium, arsenic, lead.

Incompatibles.—Alkaline carbonates, potassium iodide.

Action.—Sedative, astringent, both externally and internally.

B.P. Dose.—5 to 20 grs.

OFFICIAL PREPARATION

1. **Liquor Bismuthi et Ammonii Citratis.** *Syn. B.P.*—*Liquor Bismuthi.*—3 grs. of Bismuth Oxide in 1 dr. A colourless, neutral or slightly alkaline solution with a metallic taste. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.

NON-OFFICIAL PREPARATIONS

1. **Liq. Bismuthi Conc. B.P.C.** *Dose*.—15 to 30 ms.
2. **Mist. Bismuth. Comp. B.P.C.**—Morph. Hyd. 8 grs., Water 4 drs. Dissolve and add Tr. Card. Co. 3 ozs., Chloroform 70 ms., Ext. Nucis Vom. Liq. 135 ms., Acid Hydrocyan. Dil. 320 ms.; mix and add Liqr. Bismuth. Conc. B.P.C. 15 ozs. and water to 1 pint. *Dose*.—20 to 30 ms.
3. **Pulv. Bismuthi Co.** *Syn.*—*Ferric's Snuff.*—Bis. Subnitrate 6 drs., Morph. Hyd. 2 grs., Powdered Acacia Gum 2 drs. Mix. Useful in *coryza*. A pinch each time till the nostrils are cleared
4. **Lotio Bismuthi B.S.H.**—Subnitrate 10 grs., water 1 oz. A sedative lotion in *eczema*.
5. **Ung. Bismuthi.**—Subnitrate 1 in lard 8.

ADDITIONAL DERIVATIVES OF BISMUTH

1. **Bismuthi Albuminate.** *Syn.*—*Bismutosa.* *Dose*.—20 to 60 grs.
2. **Bis. Beta-naphtholate.** *Syn.*—*Orphol.*—Less irritating than naphthol. A gastro-intestinal antiseptic and astringent. *Dose*.—10 to 30 grs.
3. **Bis. Benzoate.** *Syn.*—*Bis. Oxybenzoate*—A white, impalpable, antiseptic powder used for stimulating indolent *ulcers* and *chancres*. *Dose*.—5 to 20 grs.
4. **Bis. Citrate.**—A white powder slightly soluble in water. *Dose*.—2 to 5 grs.
5. **Bis. Lactate.**—Useful in *gastrodynia*. *Dose*.—5 to 20 grs.
6. **Bis. Loretinate.**—Dusted on *ulcers* or wounds like iodoform. Internally in *phthisical diarrhœa*. *Dose*.—5 to 10 grs.
7. **Bis. Naphthalin-benzoate.** *Syn.*—*Intestin*—Acts like orphol.
8. **Bis. Oleate.**—A bland non irritating demulcent.
9. **Bis. Oxychloride.**—Impalpable non-irritating powder used as a cosmetic and as a sedative coating in irritable conditions of the mouth, throat, vagina, and rectum. *Dose*.—5 to 20 grs.
10. **Bis. Oxydide.**—A brownish-red, amorphous powder insoluble in water. Used like iodoform. *Dose*.—5 to 10 grs.
11. **Bis. Oxyiodogallate.** *Syn.*—*Amol*—A greyish green powder used as a substitute for iodoform, and injected as an emulsion with glycerin (10 p.c.) in *gonorrhœa*.
12. **Bis. Oxybromide.**—A yellowish fine powder. Used in *hysterical dyspepsia* with gastric pains and vomiting. *Dose*.—5 to 7 grs.
13. **Bis. Peptonate.**—A brown powder containing 3½ p.c. of bismuth oxide. Very easily assimilable. *Dose*.—1 dr.
14. **Bis. Phosphate.**—A soluble white powder, in acute *gastric* and *intestinal catarrh*. *Dose*.—3 to 8 grs.
15. **Bis. Pyrogallate.** *Syn.*—*Helcosol*—A yellow powder soluble in alkaline secretions. Used as an antiseptic in skin diseases. *Dose*.—2 to 8 grs.
16. **Bis. Phenolate.**—A greyish neutral powder, may be used as a substitute for iodoform and as an intestinal antiseptic. *Dose*.—5 to 20 grs.
17. **Bis. Sulphocarbonate.**—An intestinal antiseptic. *Dose*.—4 to 8 grs.
18. **Bis. Sodium-phospho-salicylate.** *Syn.*—*Bismuthol*.—A white powder, may be used like iodoform combined with tale (1 in 5).
19. **Bis. Methylen-digallate.** *Syn.*—*Bismal*.—May be sprinkled over *ulcers* and *intertrigo* and given in *tubercular diarrhœa*. *Dose*.—10 to 15 grs.

20. **Bis. Subgallate.** *Syn.*—*Dermatol.*—A yellow, odourless, non-irritating and non-poisonous powder, superior to iodoform as a dressing in *ulcers, burns, wounds, chancres, eczema, &c.* It may be applied as a paste, powder, collodion, glue, or ointment. Found invaluable in *tubercular diarrhoea*. Has been used also in *gastric ulcer* and *cancer*. *Dose.*—30 to 90 grs. daily.

21. **Bis. Resorcinate.**—A yellowish powder, may be used as a substitute for iodoform.

22. **Bis. Iodo-Resorcin-Sulphonate.** *Syn.*—*Anusol.*—In *piles* as a suppository.

23. **Eudoxin.**—A bismuth salt of tetraiodophenolphthalein (nosophen). In reddish-brown insoluble powder, used in *tubercular ulceration* of the bowels in 15 gr. doses, and the *enteritis* of children in 2 to 4 grs. Externally like iodoform.

24. **Erythrol.**—A double iodide of bismuth and cinchonidine. Useful in *butyric acid dyspepsia*. *Dose.*— $\frac{1}{2}$ to $\frac{3}{4}$ gr.

25. **Bismuth Tannate.**—A yellow powder, insoluble in water. Useful in *diarrhoea* and *dysentery*. *Dose.*—10 to 30 grs.

26. **Bis. Tribromophenol.** *Syn.*—*Xeroform.*—A greenish-yellow powder. Powerful intestinal antiseptic, recommended in *cholera*. Used also as a dusting powder in place of iodoform. *Dose.*—5 to 20 grs.

PHARMACOLOGY OF BISMUTH SALTS

Externally.—Bismuth salts have no action on the unbroken skin, but on the denuded surface they act as a **sedative, mild astringent and antiseptic**.

Internally. **Gastro-intestinal tract.**—Bismuth salts blacken the tongue, have no taste and produce a feeling of roughness in the mouth. The sparingly soluble salts in large doses and the soluble salts in small doses act as direct **sedatives** to the mucous membrane of the stomach and intestine. How they act, whether by mechanically shielding the nerve-terminations from the irritating secretions, or by altering the composition of the secretions or by modifying the circulation, is not known. As a consequence of this sedative effect, they act as **anti-emetics** and **mild astringents**. They also control fermentation, especially the salicylate, sulphocarbolate, phenolate, &c., and are therefore **intestinal antiseptics**. Bismuth subnitrate splits up into bismuth oxide and nitric acid in water, liberating nitrous fumes which tend to contribute towards the antiseptic property of the drug. In moderate doses bismuth acts in the same manner as small doses of arsenic, 1 dr. of liq. bismuthi being equal to $\frac{1}{2}$ m. of liq. arsenicalis. In large doses it produces **gastro-intestinal irritation** like arsenic or antimony though not so powerfully. It passes out with the faeces as a sulphide, colouring them leaden black.

Remote action.—Bismuth salts are slowly absorbed. We know little of their remote action. According to some authorities they are carriers of oxygen like arsenic, especially the oxide. But this is certain, that soluble salt when taken for long periods produce fatty degeneration of the liver in the same way as phosphorus and arsenic. But how far these effects are due to arsenic as an impurity in the

drug is not easy to say. Sometimes we observe a purplish line on the gums and an onion-like smell in the breath. The latter is believed to be caused by traces of tellurium—also an impurity in bismuth preparations.

Elimination.—Bismuth is eliminated in the intestinal secretion, urine and milk. A portion is deposited in the liver, spleen, kidneys and nervous system.

THERAPEUTICS OF BISMUTH SALTS

Externally.—Bismuth is a **cosmetic**, the oxychloride being preferred for this purpose, as it can be reduced to the finest powder. Persons using this cosmetic should avoid sulphuretted hydrogen which acts chemically on the metal and turns the face leaden black. As a **local sedative, astringent and antiseptic**, bismuth may be applied in the form of powder, lotion or ointment to **chapped hands and nipples, irritable ulcers, intertrigo, herpes, eczema, &c.** In weeping eczema the writer uses the subnitrate and oxide of zinc in equal parts as a dusting powder after painting the red areola with a silver solution (see p. 256). Bismuth salicylate, dermatol and many non-official derivatives may be used as substitutes for iodoform. Ferrier's snuff wonderfully checks **coryza** and **chronic nasal catarrh**. Bismuth subnitrate (60 grs. to water 1 oz. suspended by mucilage or glycerin) may be used as an injection in **gonorrhœa** or **leucorrhœa**, and as a pessary (oxychloride 10 grs.) in irritable conditions of the cervix and os.

Internally.—As a *gastric sedative* bismuth salts are remarkably efficacious in all **irritable and painful gastric disorders**, such as atarrh, vomiting, indigestion, gastrodynia, pyrosis and ulcers, simple and malignant. The only drawback to their use is that they cause constipation. If the pain is intense they may be combined with morphine, and if the gastric irritability is great, with hydrocyanic acid dilute.

As an *intestinal sedative and astringent* they are largely employed in all forms of **diarrhœa**, acute or chronic, either in children or adults. The salicylate is a useful remedy for children's diarrhœa due to the decomposition of food, because it has the properties of both bismuth and salicylic acid. Occasionally it may with advantage be combined with grey powder. It has also been found very useful in **summer, tubercular, enteric and lenteric diarrhœas and cholera**. The bismuth salts are most effective medicines in **mucous diarrhœa, and dysentery**. In the last disease they may be given with ipecacuanha in the acute stage, or with Dover's powder to check the after diarrhœa.

Other uses.—In association with the Röntgen rays bismuth has been largely used for diagnostic purposes in connection with diseases of the *gastro-intestinal tract* :—

(a) In *stricture of the œsophagus* a bolus of bismuth and flour is given, and its passage down the œsophagus and arrest at the seat of stricture observed under the "X" rays.

(b) 2 ozs. of bismuth subnit. with 6 ozs. of rice pudding when administered enables the outlines of the stomach to be determined, the presence of hour-glass contraction seen, and the position of the pylorus located. The stomach tube may be filled with bismuth subnit. and then passed when dilatation of the stomach can be made out and also the most dependent point of the lower border.

(c) Injected into the rectum suspended in starch important facts for diagnosis can subsequently be learned by "X" ray examination.

Prescribing hints.—As the less soluble preparations allay irritation better than the soluble ones, they are to be preferred when gastric or intestinal irritability is a prominent symptom. For this purpose we use either the carbonate or the subnitrate. If they are given in a mixture they should be suspended by the compound tragacanth powder, and not by the mucilage of acacia, as the latter may convert the mixture into a jelly-like mass. Again the subnitrate should not be combined with any alkaline carbonates, for bismuth oxynitrate slowly parts with nitric acid in water and gives off carbonic acid (*see p. 81*), but this objection does not apply to the carbonate. Neither should they be mixed with iodides (*see p. 81*). Liq. bismuthi et ammon. citratis is more astringent and irritant than the carbonate, subnitrate and oxide, and may be given with acids or alkalis. The Royal College of Physicians in 1892 recommended the following **anticholeraic mixture**:—Bis. et Cern. Salicylas 5 grs., Pulv. Cinnamom. Co. 7½ grs., Tr. Camph. Co. 30 ms., Tr. Chlorof. Co., Sp. Ammon. Arom. aa 20 ms., Essen. menth. pip. 10 ms., Mist. Cretæ ad 1 oz. *Dose*.—1 oz. every 2 to 4 hours.

BORAX. *See page 182*

BROMUM

Bromine. Br. (*Non-official*)

Source and Characters.—A liquid non-metallic element obtained from sea-water and saline springs. From it are prepared—

AMMONII BROMIDUM

Ammonium Bromide. NH_4Br .

Source.—Formed by neutralizing hydrobromic acid with solution of ammonia, $\text{HBr} + \text{NH}_4\text{HO} = \text{NH}_4\text{Br} + \text{H}_2\text{O}$.

Characters.—In small, colourless crystals; taste pungent *Solubility.*—1 in 1½ of water, 1 in 15 of alcohol (90 p.c.). *Impurities.*—Bromates, iodides, nitrates, lead, iron.

Action.—Nervine sedative, hypnotic. **B.P. Dose.**—5 to 30 grs.

POTASSII BROMIDUM

Potassium Bromide. KBr

Source.—May be obtained by adding a slight excess of bromine to a strong solution of potassium hydroxide, evaporating the solution of

potassium bromide and bromate to dryness, decomposing the bromate by fusing the mixture with charcoal and purifying by crystallization.

Characters.—In colourless cubical crystals; taste pungent, saline. **Solubility.**—1 in 2 of water, 1 in 200 of alcohol (90 p.c.). **Impurities.**—Lead, iron, copper, arsenium, aluminium, zinc, calcium, magnesium, sodium, ammonium, bromates, iodates, cyanides, &c.

Identification.—Crystals of potassium bromide resemble those of potassium iodide, which are larger and more distinctly cubical, but this is not invariably the case. Chemical tests are the safest guide.

Incompatibles.—Solutions containing free chlorine or free acids, spirit of nitrous ether if acid, mercury, silver salts, and strychnine.

Action.—The same as above. **B.P. Dose.**—5 to 30 grs.

Enters into.—The preparation of Acid. Hydrobrom. Dil.

SODII BROMIDUM

Sodium Bromide. NaBr

Source.—Prepared in the same manner as potassium bromide.

Characters.—In small white cubic crystals, somewhat deliquescent, inodorous; taste saline. **Solubility.**—1 in less than 2 of water, 1 in 16 of alcohol (90 p.c.). **Impurities.**—The same as of potassium bromide.

Incompatibles.—The same as of potassium bromide.

Action.—Similar to Ammonium Bromide. **B.P. Dose.**—5 to 30 grs.

NON-OFFICIAL PREPARATIONS AND DERIVATIVES

1. **Ethyl Bromide.**—A colourless volatile liquid with a peculiar odour and sweetish warm taste. Used for local anaesthesia for *neuralgia*. 5 ms. capsules useful in *epileptic convulsions* and *asthma*.

2. **Lithium Bromide.**—A white granular deliquescent salt containing bromine 91 p.c. Useful in *Bright's disease*. **Dose.**—5 to 15 grs.

3. **Rubidium Bromide.**—In white crystals. **Dose.**—5 to 30 grs.

4. **Rubidium Ammonium Bromide.**—In white granular crystals; more powerful than potassium bromide in *epilepsy*. **Dose.**—90 grs. daily.

5. **Strontium Bromide.**—In deliquescent, acicular crystals. Better borne than potassium bromide. **Dose.**—5 to 30 grs.

6. **Bromalin.** *Syn.*—*Bromethyl-formin.*—Colourless scales soluble in water. A nerve sedative without producing skin eruptions. **Dose.**—10 to 30 grs.

7. **Bromidia.** *Syn.*—*Liq. Bromo-Chloral Comp.* **B.P.C.**—1 dr. contains 10 grs. of each of Chloral Hydrate and Pot. Bromide. Chloral Hydrate 1600 grs., Tr. Cannab. Ind. 400 ms., Tr. Aurant. 400 ms., Suc. Hyocyan. 1600 ms., Syrup 3½ ozs., Ex. Glycyrrh. Liq. ½ oz. Dissolve and add Pot. Bromide 1600 grs. dissolved in 7 ozs. of water. Filter and add water to 20 ozs. **Dose.**—½ to 2 drs.

8. **Bromoform.**—A colourless, volatile, sweet liquid, with an agreeable odour, soluble in chloroform, ether, and slightly in water. Most efficacious in *whooping cough*, diminishing the number, duration, severity, and vomiting. **Dose.**—2 to 5 ms.; ½ to 1 m. for a child 1 year old.

9. **Bromipin.** *Syn.*—*Brominol*—A yellow oily liquid prepared by mixing bromine with sesame oil (*tul oil*). An easily absorbent organic preparation of bromide very useful in *epilepsy* and *neurosis*.

Dose.—1 to 4 drs. in emulsion or hydro-alcoholic solution.

10. **Bromo-Hæmol.**—A compound of bromine with hæmoglobin in brown powder. Recommended in *hysteria* of *anæmic subjects*. *Dose.*—15 to 30 grs.

11. **Liq. Arsenici Bromatus.**—See p. 172.

12. **Liq. Auri et Arsenii Bromidi.**—See p. 172.

13. **Magnesi Bromidum.**—A nervine sedative in *hysteria* and *epilepsy*. *Dose.*—10 to 20 grs.

14. **Manganesii Bromidum.**—A nervine tonic. *Dose.*—1 to 3 grs.

15. **Calcii Bromidum.**—Given with good results in *epilepsy*. *Dose.*—10 to 20 grs.

16. **Bromal Hydras.**—Large oblique colourless prisms, that melt on the hand. For relieving pain or producing sleep. Not of much value, as it causes pyrosis, vomiting, and diarrhoea. *Dose.*—2 to 5 grs.

17. **Bromalbacid.**—A brownish powder containing 6 p.c. of Bromine. Used as a nervine sedative. *Dose.*—15 to 30 grs. per diem.

18. **Bromocoll.**—A Bromine Tannin-Gelatin compound, in the form of a yellowish powder containing 20 p.c. Bromine and 30 p.c. Gelatin. A substitute for the alkaline bromides in *epilepsy*, *insomnia*, &c. Passes undecomposed through the stomach and is not absorbed till it reaches the intestines. Should be given in cachets. *Ordinary Dose.*—8 grs. May be increased to 130 grs. in *epilepsy*.

PHARMACOLOGY OF THE BROMIDES

Externally.—Bromine, like chlorine and iodine, destroys enzymes and organized ferments and is therefore a **disinfectant** and **deodorant**. Applied to the skin it acts as an **irritant** and **caustic**. Bromides have no action on the unbroken skin, but on the denuded surface a concentrated solution acts as an **irritant**. The fumes of bromine are so irritating to the respiratory tract that they cannot be inhaled.

Internally. **Alimentary canal.**—Either in concentrated solution applied to the throat or in repeated large doses given by the mouth, bromides **diminish** the **sensibility** and the **reflex excitability** of the fauces. Tickling the pharynx then no longer tends to excite vomiting even though the tactile sensation may remain. The bromides are readily absorbed by the gastro-intestinal mucous membrane, and according to some authorities they are converted into sodium bromide before absorption. They appear to have no influence on the stomach.

Heart and circulation.—Some believe that all bromides are changed into the sodium salt in the blood. But it is certain that they circulate as sodium bromide, and pass through the different organs as such. Bromides, particularly the potassium bromide, act as **direct sedatives to the heart diminishing its force and frequency** by a paralysing influence on the heart substance, and not through the cardio-inhibitory centre. In toxic doses the heart's action is arrested in diastole. It is not yet settled how far bromides can contract the blood-vessels.

Respiration is only slightly depressed, probably through their influence on the circulation.

Temperature is also depressed only by toxic doses, probably by the depressed condition of the circulation.

Nervous system.—The chief action of bromides is on the entire nervous system which is **powerfully depressed**. In their progressive action on this system, they follow the "Law of Dissolution" (see p. 157), i.e. the highly-developed functions are affected first, then the lower and lastly the spinal ones.

Cerebrum.—All bromides **lessen the functional activity of the brain**. The sensibility, excitability and emotional activity are all diminished, thereby inducing a state most favourable for sleep. Hence they are **hypnotics** (see p. 158). It is not definitely known whether they act on the nerve-cells or on the circulation. They also depress the **cortical motor area** (see p. 160), and in excessive doses cause degeneration of the cortical cells beginning at the ends of the dendrons.

Medulla and cord.—The great vital centres are more or less depressed. There is considerable **impairment of the reflex excitability** induced partly by the paralysed condition of the peripheral sensory nerves but chiefly by the diminished excitability of the nerve-centres.

In brief, bromides depress (1) the cortical motor cells, (2) the medullary and spinal centres, (3) reflex excitability in connection with all the sentient surfaces of the body, (4) the activity of the sensory mechanism, and (5) that of the peripheral nerves.

Muscles.—The bromides not only **impair the activity** of the muscles by their action on the motor cells and reflex centres, but by their direct influence on the muscles themselves. They may be paralysed to such an extent that no convulsions can be produced by poisoning with strychnine. Therefore they are powerful **anti-spasmodics**.

Metabolism.—Large doses affect metabolic activity by reducing the exhalation of carbonic acid. The amount of urine as well as its colouring and nitrogenous matters and sulphur are increased, while phosphorus is decreased.

Genitals.—Bromides decidedly lessen virility and if continued long the sexual passion. Hence they are **anaphrodisiacs**.

Elimination.—Bromides are soon eliminated, chiefly by the kidneys, intestinal and bronchial mucous membrane, skin, saliva and milk. Many think that they depress the sensibility of the fauces during their excretion through its mucous membrane.

Acute toxic action.—Acute poisoning is rare. But if $\frac{1}{2}$ to 1 oz. is swallowed, weakness, frontal headache, reduction of pulse-rate, irregular pulse, insensibility, aphasia, amnesia are the chief symptoms. Recovery takes place as a rule unless oedema of the lungs supervenes.

Chronic toxic action or "Bromism."—A group of symptoms following a prolonged use of bromides is known by the name of "bromism." They are an eruption resembling acne which may lead to boils, chiefly on the

face and back, mental dulness, anæmia, general prostration, muscular weakness, imperfect articulation, staggering gait, drowsiness, and inclination to sleep, lowering of cutaneous sensibility, abolition of reflex action of the pharynx, conjunctivitis, slight increase of bronchial secretion and impairment of sexual powers. The mental faculties may be so much depressed in bad cases, that melancholia, dementia, or other mental disorders may follow.

Antidotes.—The mere stoppage of bromides is enough in the early stage, but by administering an extra quantity of common salt (sodium chloride) with food, the ill-effects of the drug may be counteracted.

Physiological antagonists. —Strychnine and atropine.

THERAPEUTICS OF BROMIDES

Internally. **Alimentary canal.**—Before cocaine was known, a solution of potassium bromide was painted several times on the back of the throat before laryngoscopic examination. Bromides are very useful in **reflex vomiting**, such as the vomiting of pregnancy, seasickness and vomiting occasioned by nervous disorders. Ringer recommends them in the **spasmodic intestinal colic** of children.

Nervous system. As a *hypnotic* bromides are very efficacious in sleeplessness caused by worry, overwork or mental strain. In **delirium tremens**, **mania**, **acute inflammatory or febrile diseases**, **cerebral congestion**, **night-screaming** of children, **nightmare** of children and adults, bromides may be used with the greatest benefit either to induce sleep or to allay irritability. As a *soother of excitability* bromides are very effective in many **nervous headaches**, **irritability of temper** especially of gouty persons, **nervous excitability** of females either during the latter months of pregnancy or the change of life, **hysteria**, **hypochondriasis**, &c. According to Brunton the recurrence of **morning headache** may in many cases be prevented by giving 20 to 30 grs. of bromide with 10 to 15 grs. of sodium salicylate at night, repeated once or twice next morning, if it is not entirely checked. As a *muscular and spinal depressant*, they are considered very valuable in all forms of **convulsive diseases**, such as **epilepsy**, **infantile convulsions**, **puerperal eclampsia**, **convulsions of Bright's disease** or of **uræmia**, **hysteria**, **chorea**, **tetanus**, **painful cramp of muscles**, &c. In **epilepsy** their efficacy is most marked in *grand mal*, producing little or no effect in *petit mal*. But in order to obtain the full benefit of bromides, they should be continued with occasional interruptions for one to three or more years. Even then we cannot be confident of a permanent cure. Indiscriminate prolonged use sometimes damages the mental faculties.

Bromides are of special value in many convulsive diseases of the respiratory organs, such as **whooping cough**, **asthma**, **spasmodic bronchitis**, **laryngismus stridulus** and **acute laryngitis**. In the last two, they must be given in large doses. In whooping cough the ammonium bromide is considered more efficacious.

Heart.—In some **nervous disorders** of the heart due either to dyspepsia, hysteria or alcoholism, sodium or ammonium bromide is of great use.

Genital organs.—Potassium bromide is a very valuable anaphrodisiac in **nymphomania**, **satyriasis** and **priapism**. Many cases of **nocturnal emission** yield to it. It checks **menorrhagia** due to ovarian irritation, **ovaritis** and **ovarian neuralgia**.

Glands.—Potassium bromide may be given to reduce **enlarged glands** and **syphilides** in cases where iodides cannot be borne. Sometimes it is employed to reduce enlarged liver and spleen. It is of no use in diabetes.

Potassium bromide may be used to *lessen the disagreeable effects* of opium, quinine, salicin and salicylates.

Caution.—Bromides should be avoided in cardiac and nervous weakness, senile softening of the brain, and gastro-intestinal irritation.

Prescribing hints.—Bromides may be administered by the mouth, rectum or hypodermically. By the mouth in the form of lozenge, tablet or mixture. Their taste is fairly well disguised by the liquid extract of liquorice, milk or beer. For an enema they may be dissolved in gruel or mucilage and for a hypodermic injection in water (6 grs. in 1 dr.). Their efficacy is greatly enhanced if potassium, sodium and ammonium bromides are given in combination, and the patient is restricted to vegetable food. Of the three salts, sodium and ammonium bromides are not depressant to the heart. To prevent acneiform eruptions they may be combined with small doses of arsenic. The hypnotic effect of the bromides may be greatly increased if they are given with chloral hydrate, morphine or hyoscyamus. In some cases of *insomnia* bromide may be used with great advantage. Children and anæmic persons cannot bear a protracted course of bromide treatment. In *whooping cough* bromoform is sometimes more beneficial than ammonium bromide. Bromides should not be prescribed with strychnine or other alkaloids in a mixture, as this will throw down alkaloidal precipitates, especially if the solution is concentrated.

BUCHU FOLIA

Buchu Leaves. N.O. *Rutaceæ*

Syn.—Bucco, Diosma.

Habitat.—Cape of Good Hope.

Source.—The dried leaves of *Barosma betulina*.

Characters.—From $\frac{1}{2}$ to $\frac{3}{4}$ in. long, dull, yellowish-green, rhomboid ovate, glabrous, somewhat warty, margin denticulate, apex blunt recurved, with visible oil glands. Odour and taste characteristic. **Impurities.**—Leaves of *Eleocharis serrulatum* which have no glands.

Identification.—Resemble *Scirpus* and *Urtica*, which are entire.

Composition.—(1) A *Volatile Oil* in the glands containing barosma camphor which deposits on exposure. (2) A *Bitter Principle*. (3) *Mucilage*.
Action.—A stimulating diuretic.

OFFICIAL PREPARATIONS

1. *Infusum Buchu.*—1 in 20. $\frac{1}{4}$ hour. **B.P. Dose.**—1 to 2 ozs.
2. *Tinctura Buchu.*—1 in 5. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.

PHARMACOLOGY

Internally.—The action of buchu is due to the volatile oil and the bitter principle which it contains. In medicinal doses it causes a sensation of warmth in the stomach, and in large doses nausea and vomiting. The volatile oil is readily absorbed into the blood and is mostly excreted by the kidneys which it stimulates, and partly by the bronchial mucous membrane which is also gently stimulated. Hence buchu is a stimulating **diuretic** and a mild **expectorant**. During its elimination it soothes and disinfects the urinary passages and imparts a peculiar odour to the urine.

THERAPEUTICS

Internally.—Buchu is chiefly used to allay the irritability of the urinary tract, especially the bladder, and is therefore very serviceable in **cystitis, irritability of the bladder, urethritis, gonorrhœa, pyelitis, &c.** Sometimes it is given in **chronic bronchitis**. If continued too long in large doses, it may harm the kidneys. Brunton says that buchu is given in 20 gr. doses in diarrhœa and dysentery in South Africa.

Prescribing hints.—The infusion makes a good vehicle for diuretics, but the tincture contains more oil and therefore does not mix well with water. As its action resembles that of *Parcira* and *Uvæ Ursi* it may be combined with them with benefit.

BUTEÆ GUMMI. Butea Gum

N.O. *Leguminosæ*

(*Ind. and Col. Addendum*)

Syn. B.P.—Bengal Kino. **Syn. I. V.**—*Palis Gand.* Beng., Hind.

Habitat.—India and Eastern Colonies.

Source.—Inspissated juice obtained from incisions in the stem of *Bul a frondosa*.

Characters.—In small, irregular, shining fragments of a dark ruby colour; inodorous; taste astringent. **Solubility.**—Partially in water. **Impurities.**—Corky and woody particles.

PHARMACOLOGY AND THERAPEUTICS

The Bengal kino may be employed in making the official preparations for which the B.P. kino is used in India and Eastern Colonies. Its actions and uses are similar to those of the B.P. kino.

BUTEÆ SEMINA. Butea Seeds

(Ind. and Col. Addendum)

Source.—The seeds of *Butea frondosa*.**Characters.**—Flat, reniform, 1 to 1½ in. long, ¾ to 1 in. wide, ⅛ to ⅓ in. thick. Testa thin, glossy, wrinkled, reddish-brown. Hilum large, prominent. Odour faint. Taste slightly acrid.

OFFICIAL PREPARATION

1. Pulvis Buteæ Seminum.—The kernel dried and powdered, freed from the testa after soaking in water. **B.P. Dose.**—10 to 20 grs.

PHARMACOLOGY AND THERAPEUTICS

Externally.—The seeds made into a paste with lime-juice act as a **rubefacient** and may be used in ringworm. The leaves as a poultice may be used to disperse boils, pimples, buboes, and hæmorrhoids.*Internally.*—The seeds are a powerful **anthelmintic** for **round-worm** and may be used as a substitute for santonin, followed as usual by a dose of castor oil.

The flowers yield a fine yellow dye, and the charcoal of the wood is used for bleaching morphine at the Ghazipur factory.

BUTYL-CHLORAL HYDRASButyl-Chloral Hydrate. $\text{CH}_3\cdot\text{CHCl}\cdot\text{CCl}_2\cdot\text{CH}(\text{OH})_2$ **Syn.**—Croton-Chloral Hydrate, Trichlorbutylidene Glycol.**Source.**—Obtained by the addition of water to the liquid butyl-chloral produced by the action of chlorine gas on aldehyde.**Characters.**—In pearly white, trimetric laminae, having a pungent but not acrid odour and an acrid nauseous taste. *Solubility*—1 in 50 of water, 1 in 1 of glycerin, and alcohol (90 p.c.), 1 in 20 of olive oil.**Incompatibles.**—Alkalis, antipyrin.**Action.**—Analgesic. **B.P. Dose.**—5 to 20 grs. *Daily Dose.*—64 grs.

NON-OFFICIAL PREPARATIONS

1. Mistura Butyl-Chloral. T.H.—Butyl-Chloral Hydrate 4 grs., Glycerin 15 m., Chloroform Water to 1 oz.**2. Pilula Butyl-Chloral.**—Butyl-Chloral Hydrate 4 grs., Compound Pilocarpus Powder 1 gr., Water q.s. For 1 pill.**3. Syrupus Butyl-Chloral. B.P.C.**—Butyl-Chloral Hydrate 320 grs., Syrup to 1 pint. Dissolve in hot syrup. *Dose.*—1 to 4 drs.**4. Chloretone.**—Trichlor - Tertiary - Butyl - Alcohol. White needle-like crystals, with a camphoraceous taste. A *hypnotic, local anæsthetic, and chæstic*. Useful in *piles and pruritus*. A very valuable remedy for *sea-sickness*.*Dose*—5 to 24 grs. In capsule or cachet. As a dusting powder, use | chloretone 23, zinc oxide 120, and French chalk 90 parts.

PHARMACOLOGY

The action of butyl-chloral hydrate is very similar to that of chloral hydrate though not so powerful. The difference between the action of these two drugs will be better understood by reference to the following table :—

Butyl-Chloral Hydrate	Chloral Hydrate
1. A feeble local anæsthetic.	A powerful local irritant and vesicant in a concentrated solution
2. Less certain, less rapid, and a less powerful hypnotic.	More certain, more rapid, and a more powerful hypnotic.
3. Less depressant to the heart.	More depressant to the heart.
4. An anæsthetic of the fifth nerve and the regions supplied by it.	<i>Nil.</i>
5. Not a general analgesic.	A powerful general analgesic, but inferior to morphine or belladonna.
6. Not so poisonous.	Distinctly poisonous.

THERAPEUTICS

Externally.—Butyl-Chloral hydrate is sometimes locally applied in combination with menthol to annul the pain of a **carious tooth**.

Internally.—As a *hypnotic* it is seldom used except in **insomnia** with **cardiac weakness**, where chloral hydrate is contra-indicated. Its chief use is in **neuralgia** of the **fifth nerve**, *i.e.* of the face and a portion of the scalp. According to Ringer it is useful in nearly all neuralgic conditions of the face, occiput, neck, and in **migraine**. It has been used with doubtful success in dysmenorrhœa and neuralgia of the limbs.

Prescribing hints.—It is best given in pill which should be made fresh. Syrup of tolu, glycerin and almond mixture fairly cover its taste. In *neuralgia* it is better to give a first dose of 10 grs. and then 5 grs. every two hours until the pain is relieved.

CADINUM OLEUM. Oil of Cade

N.O. *Comifera*

Syn. B.P.—Juniper Tree Oil, Huile de cade.

Habitat.—Southern Europe.

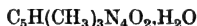
Source.—An empyreumatic oily liquid obtained by the destructive distillation of the woody portions of *Juniperus oxycedrus*, and some other species.

Characters.—A dark reddish-brown, viscid, oily liquid. Odour empyreumatic. Taste aromatic, bitter, acid. Sp. gr. 0.990. *Solubility.*—Freely in chloroform and ether, partially in alcohol (90 p.c.) and slightly in water.

PHARMACOLOGY AND THERAPEUTICS

Externally.—The oil of cade resembles tar in its action, but has a more pleasant odour. It may be used in **chronic inveterate eczema, psoriasis** and other skin diseases attended with itching. It is given in the shape of an ointment combined with vaseline or simple cerate, or in a liquid form (oil of cade 1, soft soap 5, alcohol [90 p.c.] 4).

CAFFEINA. Caffeine



Syn. B.P.—Theine. Guaranine.

Habitat.—China, Japan, Upper India, Ceylon.

Source.—An alkaloid obtained from the dried leaves of tea—*Camellia thea* (N.O. *Ternstroemiaceæ*), or the dried seeds of coffee—*Coffea arabica* (N.O. *Rubiaceæ*).

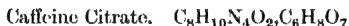
Tea yields 3 p.c., coffee seeds 1 p.c., guarana 5 p.c., *maté* or Paraguay tea 0.5 p.c., kola nut 3 p.c. Caffeine may be synthetically prepared from xanthine. Chemically it is *trimethyl-xanthine*.

Characters.—Colourless, silky, acicular, inodorous crystals. *Solubility*—1 in 80 of cold, and easily in boiling water, alcohol, and chloroform. The aqueous solution is neutral.

Incompatibles.—Tannic acid, potassium iodide and mercurial salts.

Action.—Cardiac tonic, diuretic. **B.P. Dose.**—1 to 5 grs.

CAFFEINÆ CITRAS



Source.—An unstable compound prepared from caffeine and citric acid (1 in 1).

Characters.—White inodorous powder with an acid and slightly bitter taste. *Solubility.*—1 in 32 of water, also in a mixture of 2 of chloroform and 1 of alcohol (90 p.c.).

Action.—The same as that of caffeine. **B.P. Dose.**—2 to 10 grs.

OFFICIAL PREPARATION

1. **Caffeinæ Citras Effervescens.**—1 in 25. **B.P. Dose.**—60 to 120 grs.

NON-OFFICIAL PREPARATIONS AND DERIVATIVES OF CAFFEINE

1 **Caffeinæ Ammonio-Citras.**—White crystals slightly soluble in water. *Dose.*—1 to 10 grs.

2 **Caff. Hydrobromid.**—Transparent crystals. *Dose.*— $\frac{1}{2}$ to 5 grs.

3 **Caff. Hydrobrom. Efferv. B.P.C.**—*Dose.*—60 to 120 grs.

4 **Caff. Sodio-Salicylas.**—A white amorphous powder soluble in water, chiefly used for hypodermic injection. *Dose.*—1 to 4 grs.

5 **Caff. Sulphas.**—White crystals soluble in water. *Dose.*— $\frac{1}{2}$ to 5 grs.

6 **Iodo-Caffeine.** *Syn.*—*Sodium-Caffeine-Iodide.*—In cardiac dropsy and *pleurisy* with effusion. *Dose.*—2 to 10 grs.

7 **Caffeine-Chloral.**—Granular crystals. Soluble. Analgesic and laxative. In *rheumatism, sciatica, &c.* *Dose.*—3 to 8 grs.

8. **Caff. Valerianas.**—White crystals. In *hysteria* and *pertussis*. *Dose.*— $\frac{1}{2}$ to 3 grs.

9. **Migrainine.** *Syn.*—*Antipyrin-Caffeino-citricum.*—Crystals soluble in water. In *headache*, but causes sleeplessness. *Dose.*—8 to 15 grs.

10. **Symphorol.**—Three compounds are sold under this name. They may consist of *caffeine-sulphonic acid* combined with lithium (**Symphorol L.**), with sodium (**Symphorol N.** *Syn.*—*Nasrol*) with strontium (**Symphorol S.**). All are white crystals and act as diuretics and are used in *cardiac and renal dropsy*. *Dose.*—10 to 15 grs.

11. **Ext. Kolæ Liq. B.P.C.**—Prepared from the seeds of *Colavera*, which contain about 2 to 2.5 p.c. of caffeine. *Dose.*—10 to 20 ms.

PHARMACOLOGY

Internally.—Caffeine seems to stimulate, though not in every case, the salivary and gastric glands and dilate the gastro-intestinal blood-vessels. Hence, tea and coffee are **digestive adjuvants** under certain conditions. With some, coffee acts as a mild **aperient**. In excessive doses they are gastro-intestinal **irritants** causing dyspepsia.

Heart.—Caffeine readily enters the blood and circulates unchanged. In medicinal doses it not only **strengthens the force of the contractions** but **increases the systolic period**, and thereby shortens the diastolic one. As a consequence of this, the **arterial tension is heightened** and the pulse becomes fuller and slower. In toxic doses the pulse becomes very frequent, irregular and intermittent, and at last the heart stops in systole. These effects are largely due to the direct action of the drug on the cardiac muscle, and partly on the cardio-inhibitory centre.

Blood-vessels.—It first contracts then dilates the arterioles, thereby first raising and afterwards lowering the **blood-pressure**. This is caused by its direct action on their muscular coat, and to some extent on the vaso-motor centres.

Respiration.—In medicinal doses respiration is quickened and in large doses depressed from its action on the respiratory and cardiac centres.

Temperature is not affected by small doses, but is increased by large doses.

Nervous system.—In small doses caffeine **stimulates the nerve-centres** in the **cerebrum, bulb and cord**. Its stimulating effect becomes apparent after a cup of tea or coffee by the removal of fatigue and languor, mental exhilaration and increased capability for work. In large doses it causes restlessness, wakefulness, ringing in the ears, delirium and tremors. The cord and muscles are not affected in man but in frogs either tetanic spasms or muscular rigidity occurs. The sensory and motor nerves remain unaffected.

Metabolism.—We know little of its action on tissue-change, except that it increases the excretion of xanthine and urea in the urine. These may be derived directly from the caffeine.

Kidneys.—It has been experimentally proved that caffeine first contracts the renal vessels, causing a diminished flow of urine, but this is quickly followed by dilatation of the vessels and diuresis. Caffeine also has a direct stimulating action upon the renal secretory epithelium, but this is not so marked as in the other members of the purin group—theobromine and theophylline (*q.v.*). It is therefore both a **vascular** and a **stimulant diuretic**.

Acute toxic action.—Burning in the throat, thirst, gastro-intestinal pain, violent vomiting and purging, giddiness, tremors in the extremities, free diuresis, clear intellect have been observed in a case of poisoning by 60 grs. of the citrate; recovery taking place under the use of nitro-glycerine.

Chronic toxic action.—A slow development of toxic symptoms from excessive tea-drinking is very rare, but is well illustrated in the case of Mr. P. Phelan admitted into the Bellevue Hospital, New York. Thirty cups per day without food were drunk by him when he got awfully prostrated. Extreme indigestion, extreme anæmia, complete inability to move, great cardiac and respiratory distress were the chief symptoms. Another case of excessive tea-drinking came under the notice of Dr. Gordon of the Jefferson Medical College, Philadelphia. She used to drink about 15 glasses (360 ozs.) of tea per day for two years before admission, and suffered mostly from symptoms of posterior and lateral sclerosis of the cord.

THERAPEUTICS

Externally.—An infusion of tea is often used by the writer as a collyrium in simple conjunctivitis, a gargle for sore throat, and a wash for irritable sores and ulcers. It may be injected either alone or with alum in otorrhœa and leucorrhœa.

Internally. Heart.—As a *cardiac stimulant* it has been found useful in many **cardiac diseases**, such as aortic or mitral obstruction. Its efficacy is greatly enhanced if it is combined with strychnine. As it can neither slow nor make the heart's beats regular, it cannot replace digitalis therapeutically. The writer has seen it tone up the heart and remove the intermittent character of the pulse brought on by large doses of *Apocynum cannabinum*. It is of signal service in **cardiac dropsy** on account of its dual effects on the heart and the kidneys. It may be used to strengthen the heart in many acute diseases, such as **pneumonia, fevers, &c.**

Lungs.—A cup of strong coffee occasionally relieves a fit of **bronchial asthma**. The citrate in 5 gr. doses may be used with the same effect.

Nervous system.—In **migraine** the effervescent citrate or hydrobromide is sometimes useful but it is inferior to antipyrine or phenacetin.

Kidneys.—Caffeine is an uncertain diuretic and has now been superseded by Diuretin, Agurin and Theocin. Whitla speaks favourably of it in **chronic Bright's disease**, as he has found it to reduce both albumen and anasarca. Many patients get habituated to its use, and its diuretic action is entirely lost on them after a week or so. On

account of its stimulating action upon the kidney cells caffeine must never be given in cases of *acute nephritis*.

Antidote to poisons.—In opium or morphine poisoning tea or coffee has always been used with benefit.

Prescribing hints.—Caffeine is usually given in an effervescing form, but it may equally well be combined with other drugs, such as strychnine or digitalis in a mixture, as they mutually help each other, or it may be exhibited alternately with digitalis. The writer always prescribes it with phenazone or phenacetin in cachets in *migraine*. Caffeinæ sodio-salicylas may be used hypodermically, or be extemporaneously prepared by dissolving caffeine 20 grs. and sodium salicylate 17½ grs. in distilled water 1 dr. (3 ms. = 1 gr.). Caffeine sometimes causes so much insomnia that its use has to be discontinued.

CAJUPUTI OLEUM

Oil of Cajuput. N.O. *Myrtaceæ*

Syn. I. V.—*Kajaputir tel*, Beng. *Kajaputi ke tel*, Hind., Bom.

Habitat.—Imported from Singapore and Batavia.

Source.—Distilled from the leaves of *Melaleuca leucadendron*.

Characters.—Bluish-green; odour penetrating, agreeable, camphoraceous; taste aromatic, bitterish, camphoraceous. Sp. gr. 0.922 to 0.930. Colourless when rectified. **Solubility.**—In alcohol (90 p.c.). **Impurities.**—Other oils, copper, and camphor.

Identification.—Its colour and smell help recognition.

Composition.—(1) *Cajuputene Hydrate* or cajuputol, isomeric with Borneo camphor, 75 p.c. (2) *Civetol*, a second oil. (3) *Cajuputem*.

Action.—Rubefacient, stimulant, antispasmodic.

B.P. Dose.—½ to 3 ms.

Enters into.—Lin. Crotonis and the

OFFICIAL PREPARATION

1. **Spiritus Cajuputi.**—1 in 10. **B.P. Dose.**—5 to 20 ms.

PHARMACOLOGY AND THERAPEUTICS

Externally.—It is a **stimulant** and **rubefacient** to the skin, and is therefore rubbed in as a gentle counter-irritant on the chest in **bronchitis**, **pneumonia**, **pleurodynia**, **pleuritis**, &c.; and over **painful** and **chronically inflamed joints**. It may be mixed with mustard oil or other stimulating and anodyne liniments. It has been applied with success in **eczema**, **psoriasis** and **acne rosacea**. As a **parasiticide** it may be employed in **tinea tonsurans**.

Internally.—It is a powerful **diffusible stimulant**, **carminative** and **antispasmodic**, and to some extent **narcotic**. As a stimulant it has been found useful in many **asthenic fevers**, **bronchitis** or **broncho-pneumonia**. According to Whittla its stimulating action is almost equal to that of musk. It is an excellent remedy for **flatulent colic** or **intestinal spasm**, sometimes relieving the pain by a single

dose of 20 ms. of the alcoholic solution. It has been recommended in **hysteria, neuralgia, and chronic rheumatism.**

Prescribing hints.—It may be given on sugar, in sherry or in the form of an emulsion or pill.

CALCI CARBONAS PRÆCIPITATUS

Precipitated Calcium Carbonate. CaCO_3

Syn. B.P.—Precipitated chalk. **Syn. I. V.**—*Khari*, Beng.

Source.—Obtained by the interaction of calcium chloride and sodium carbonate; $\text{CaCl}_2 + \text{Na}_2\text{CO}_3 = \text{CaCO}_3 + 2\text{NaCl}$.

Characters.—A whitish micro-crystalline powder insoluble in water. **Impurities.**—Phosphates, sulphates, iron, and alumina.

Incompatibles.—Acids and sulphates.

Action.—Desiccant, antacid, slightly astringent.

B.P. Dose.—10 to 60 grs.

Enters into.—Troch. Bismuthi Co. and Syr. Calc. Lactophosph.

CRETA PRÆPARATA

Prepared Chalk. CaCO_3

Source.—Native calcium carbonate purified by elutriation.

Characters.—White friable masses or white powder. **Impurities.**—Iron, aluminium, magnesium, phosphates, sulphates, silica.

Incompatibles.—Acids and sulphates.

Action.—The same as above. **B.P. Dose.**—10 to 60 grs.

Enters into.—Hyd. c. Creta and the

OFFICIAL PREPARATIONS

1. **Mistura Cretæ.** **Syn.**—*Chalk Mixture.*—The powder may be kept mixed in dry condition; 40 grs. to 1 oz. of cinnamon water when required. **B.P. Dose.**— $\frac{1}{2}$ to 1 oz.; 1 to 2 drs. for a child 1 year old.

2. **Pulvis Cretæ Aromaticus.**—1 in 4. **B.P. Dose.**—10 to 60 grs.

3. **Pulvis Cretæ Aromaticus cum Opio.**—1 of opium in 40. **B.P. Dose.**—10 to 40 grs.; 1 gr. for a child 1 year old.

NON-OFFICIAL PREPARATIONS

1. **Cholera and Diarrhoea Mixture** (Board of Health's prescription).—Pulv. Cretæ Arom. (B.P. 1864) 3 drs., Sp. Ammon. Arom. 3 drs., Tr. Catechu 10 drs., Tr. Card. Co. 6 drs., Tr. Opii 1 dr., Mist. Cretæ to 20 ozs. Mix. **Dose.**—1 oz. for an adult after each liquid motion.

2. **Tooth-Powder.**—Borax 4, Precipitated Chalk 8, Powdered Myrrh 2, Powdered Iridis 2, Powdered Cinnamon 2. Mix well and sift.

PHARMACOLOGY

Externally.—Chalk is a mild **astringent** and **desiccant**.

Internally. **Alimentary canal.**—It acts as a direct local **antacid**, neutralizing free acids in the mouth and stomach. If not already

acted upon, it passes readily into the intestine, where it acts as an **antacid** and a non-irritating **astringent**, caused by (1) the neutralization of any acid it meets with forming a chloride or lactate and thus reducing the secretion, by (2) its mechanical action and by (3) some obscure sedative effect on the mucous membrane. Lime salts are feebly absorbed on account of their low diffusive power and are excreted with the faeces.

Kidneys.—Some think that calcium carbonate is a **diuretic** because certain mineral waters, such as Contréxeville and Vittel containing calcium bicarbonate and sulphate among other salts, have been found useful solvents for **uric acid**. But there is no direct evidence.

THERAPEUTICS

Externally.—Chalk may be used as a **dusting powder** in **excoriations, burns and weeping eczema**. Duckworth uses it in the form of an ointment (1 in 1 of benzoated lard) in **erysipelas**.

Internally. **Alimentary tract.**—It is used as a basis for almost all the tooth powders (*see* p. 121). As an **antacid** it may be used in **acid dyspepsia**, but lime water acts much better. It is an excellent remedy for mild **diarrhoea**, especially that of children with sour-smelling stools. If the diarrhoea is caused by some irritating food, a dose of castor oil should precede its use. Lime salts are of special value in **acid poisoning**, especially in oxalic acid poisoning, as they form insoluble oxalates.

Nutrition.—Calcium carbonate is a useful remedy in deficient nutrition. Its good effects are well seen in children suffering from **rickets** and **malnutrition**, when given in very small doses. (*See* Calcium Phosphate.)

Kidneys.—It is never used as a diuretic, though Contréxeville and Vittel waters may be given largely before meals as solvents of **uric acid calculi**.

Prescribing hints.—Generally given in the form of chalk mixture with opium and astringent tinctures. Aromatic chalk powder with bismuth and grey powder is very useful in *infantile diarrhoea*.

CALCI CHLORIDUM

Calcium Chloride. $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$

Source.—Formed by neutralizing hydrochloric acid with calcium carbonate and desiccating below 392°F . $\text{CaCO}_3 + 2\text{HCl} + \text{H}_2\text{O} = \text{CaCl}_2 \cdot 2\text{H}_2\text{O} + \text{CO}_2$.

Characters.—In dry, white, deliquescent masses. **Solubility.**—1 in 1 of water, 1 in 3 of alcohol (90 p.c.). **Impurities.**—Iron, Aluminium, magnesium and carbonates.

Incompatibles.—Carbonates, phosphates, sulphates, and tartrates.

Dispensing hints.—As the salt is very deliquescent it should be preserved in hermetically sealed bottles, or in solution with the strength marked. Crystalline calcium chloride cannot be easily weighed.

Action.—Alterative, deobstruent, hæmostatic.

B.P. Dose.—5 to 15 grs.

PHARMACOLOGY AND THERAPEUTICS

Externally.—Calcium chloride is rarely used, though its lotion has been found occasionally to relieve **pruritus**.

Internally.—It is an excellent **alterative**, slowing and strengthening the pulse, and was largely employed in former years in **scrofula** with glandular enlargements of the neck, **rickets**, **tuberculosis** and **chronic diarrhoea** with impaired digestion. It is seldom used now in these cases. Its most important action is that it **increases the coagulability of the blood** more powerfully than any other lime salts; hence it is most valuable in **internal hæmorrhages**, either from the lungs, gastro-intestinal tract or other organs. The writer uses it in 10 to 15 gr. doses in preference to ergot in **hæmoptysis**, **hæmatemesis**, **intestinal** and **hæmorrhoidal bleeding** and **menorrhagia**, and finds it always effective. It is the only remedy which can arrest and prevent bleeding in **hæmophilia**. As the increased coagulability of the blood does not continue for any length of time notwithstanding continued administration, it is not so effective in **aneurism**, although cases are recorded in which great improvement followed from its use in 15 to 30 gr. doses. Many speak highly of it in **lobar pneumonia** in 5 to 15 gr. doses every 4 hours. It is very useful in certain cutaneous eruptions associated with diminished coagulability of the blood, especially **urticaria** and **erythema nodosum**.

The author's original note on this drug has been preserved, but it should be stated that recent experiments have shown that when given by the mouth it is excreted as fast as it is absorbed, and hence can have no effect in increasing the coagulability of the blood in the body whatever its effect outside. It is possible that if given subcutaneously by injection sufficient might be made to circulate in the blood as to effect the coagulability of the latter. Its use in lobar pneumonia is more than doubtful, and in our hands it has repeatedly failed in any way to influence attacks of chilblains and urticaria.

Prescribing hints.—It may be given safely up to 30 grs. three times a day, but these large doses must not be continued for more than a few days at a time. It is best given in solution after food. In **hæmophilia** 60 gr. doses have been given without bad results. But as all lime salts are feebly absorbed, we are doubtful as to the wisdom of giving it in excessive doses as it is apt to derange the stomach.

CALXLime. CaO. (*Unslaked lime*)**Syn. I. V.**—*Chun*, Beng. *Chunám*, Hind.**Source.**—Obtained by calcining chalk, limestone, or marble.**Characters.**—In compact whitish masses which swell and fall to powder by absorbing water.**Action.**—Caustic. Not used internally.**CALCI HYDRAS**Calcium Hydroxide. $\text{Ca}(\text{HO})_2$ **Syn. B.P.**—Slaked lime. **Syn. I. V.**—*Chun*, Beng. *Chunám*, Hind.**Source.**—Freshly prepared by the interaction of water and calcium oxide.**Characters.**—A white alkaline powder. **Solubility.**—1 in 900 of water, and 1 in 60 if sugar is added. **Impurities.**—Iron, aluminium, silica, alkalis, and their salts.**Incompatibles.**—Vegetable and mineral acids, alkaline, and metallic salts, tartar emetic.**Enters into.**—The preparation of Calc. Hypophosph., Chloroform, Ext. Ipecac. Liq., and the

OFFICIAL PREPARATIONS

1. **Linimentum Calcis.**—1 in 2. A substitute for **Carron oil** which is made of lime water and linseed oil. A sedative application to *burns* and *scalds*.2. **Liquor Calcis.** *Syn.*—*Lime Water.*— $\frac{1}{2}$ gr. in 1 oz. It should be kept in green bottles well corked. **Enters into.**—The preparation of Argent. Oxid., Lin. Calcis, Lotio Hydrarg. Flav., and Lotio Hydrarg. Nigra. **B.P. Dose.**—1 to 4 ozs.; $\frac{1}{2}$ to 1 dr. for a child 1 year old.3. **Liquor Calcis Saccharatus.**—8 grs. in 1 oz. Should be mixed with the solution of sugar in distilled water. **B.P. Dose.**—20 to 60 ms.

PHARMACOLOGY

Externally.—Unslaked or slaked lime is a **caustic**, but its action is localized. Lime water is a local **sedative** and **astringent** when applied to the broken skin.**Internally.** **Alimentary canal.**—Like chalk, lime neutralizes free acids of the contents of the stomach and acts as an **antacid**, but more powerfully, and thus controls the curdling of milk. It has a slight **sedative** property. In the intestine it acts as an **astringent** like chalk, but in a less degree. It is an **antidote** for poisoning by mineral acids, oxalic acid and zinc chloride. An injection of lime water kills thread-worm.**Heart and circulation.**—Only a minute quantity enters the blood and is found in the plasma as a phosphate. It has been experimentally proved that a full physiological quantity of lime circulating in the blood promotes a complete contraction of the heart, while a deficient supply weakens it. It also increases the coagulability of the blood

and thus acts as a remote hæmostatic, but not so powerfully as the calcium chloride.

Kidneys.—The greater portion is excreted by the fæces, only a small quantity passes through the kidneys, rendering the urine alkaline.

THERAPEUTICS

Externally.—As a caustic in the form of Vienna Paste (slaked lime 6, caustic potash 5, alcohol 90 p.c. *q.s.*), slaked lime may be used to destroy warts and small epithelial and other growths. Lime water, either with linseed oil (Carron Oil), olive oil or glycerin is a soothing application to burns, scalds and cracked nipples. An addition of 1 to 2 p.c. of carbolic acid increases its efficacy. It makes a soothing astringent dressing for weeping eczema, and may be used as an injection to lessen the discharges in leucorrhœa, gonorrhœa, gleet, otorrhœa, &c., even when inflammation is present. It may be injected into the rectum in thread-worm.

Internally. **Alimentary tract.**—Lime water makes a good mouth-wash for ulcerative stomatitis. It is said to dissolve false membranes of croup and diphtheria. It may either be used as a spray or applied with a brush or swab. It is chiefly used to prevent the curdling of milk (1 in 3 or more) and check vomiting. In acid dyspepsia, gastrodynia and cancer of the stomach, it must be freely employed with milk (1 in 1) to prevent regurgitation. In the same way it may be given in enteric diarrhœa and other affections to prevent the milk from forming hard indigestible lumps. As an astringent it is useful in mild infantile diarrhœa.

Prescribing hints.—Lime water is ordinarily given in milk. If the additional bulk be an objection to its use, saccharated lime water may be substituted. To suckling babies one teaspoonful with an equal quantity of milk may be given every 3 hours before nursing, and to hand-fed ones a dessert-spoonful in each bottle.

CALCII HYPOPHOSPHIS. *See* Phosphorus

CALCII PHOSPHAS

Calcium Phosphate. $\text{Ca}_3(\text{PO}_4)_2$

Source.—Obtained by (1) dissolving bone-ash in dilute hydrochloric acid, adding the liquid to dilute solution of ammonia, and washing and drying the precipitate, or (2) by the interaction of calcium chloride and sodium phosphate.

Characters.—A light white amorphous powder. *Solubility.*—Insoluble in water, soluble in dilute hydrochloric acid and nitric acid. *Impurities.*—Lead, copper, arsenium, iron, aluminium, magnesium, silica, carbonates, and calcium oxalate.

Action.—Alterative, tonic. **B.P. Dose.**—5 to 15 grs.

¶ **Enters into.**—The preparation of Ext. Euonymi Sicc. and Pulv. Antimonialis.

OFFICIAL PREPARATION

1. **Syrupus Calcii Lactophosphatis.**—*See* p. 197.

NON-OFFICIAL PREPARATIONS

1. **Calcii Glycerophosph.**—A white crystalline powder soluble in water. A most effective soluble salt. A valuable nervine tonic and alterative. *Dose.*—3 to 10 grs.
2. **Syr. Ferri Phosph. Comp. B.P.C.**—*See* Ferri Phosph.

PHARMACOLOGY

Internally.—Calcium phosphate forms the basis of new tissues and is found in excess where cell-growth is active whether normal or pathological. It has been experimentally observed that the withdrawal of lime salts from the food of animals renders their bones soft and spongy, and that fractures unite more speedily when calcium phosphate is administered to them. Hence it is an essential article of food for the nutrition and growth of nitrogenous, fatty and bony tissues. In the stomach it is acted upon by free acids and forms a soluble superphosphate, in which form it is absorbed in very small quantities, and the rest passes into the intestine unchanged. If given in excess it deranges digestion, and if continued long may form concretions in the intestine.

THERAPEUTICS

Internally.—As a *promoter* of nutrition and cell-growth, calcium phosphate is exceedingly useful in the case of **children** who have overgrown their strength; women weakened by child-bearing, prolonged suckling, or excessive menstruation; **anæmia** and **exhaustion** brought on by **prolonged suppuration, diarrhoea, leucorrhœa, chronic bronchitis, phthisis, &c.** It may also be given to expedite the union of **fractures** and the healing of **caries of bones.** Beneke considers it most efficacious in those diseases in which the phosphates are passed in excess with the urine, *e.g.* **hectic.** It is an excellent remedy for those whose health has suffered from long residence in town or from overwork. It acts remarkably well in **rickets** by rectifying the faulty nutrition and inducing a more healthy growth. But it should not be commenced until the pain and tenderness of bones have subsided. It is also recommended in **adenitis** and **mollities ossium.**

Prescribing hints.—It is useless to give this or other lime salts in large doses as they are not freely absorbed. Either the Syrup. Calcis Lactophosphatis, or the powdered phosphate in 1 or 2 gr. doses several times a day, after food, may be given with advantage. Iron or other lime salts when combined with it, as in Parrish's Chemical Food, enhance its efficacy. Calcium Phosphate may be usefully added to normal saline solution in a case where transfusion is necessary.

CALX CHLORINATA. *See* Chlorum

CALX SULPHURATA

Sulphurated Lime

Syn.—Calcium Sulphide, Canton's Phosphorus.

Source.—A mixture containing not much less than 50 p.c. of calcium sulphide, CaS , with calcium sulphate and carbon. May be prepared by heating a mixture of native calcium sulphide and carbon.

Characters.—A greyish-white powder with a smell of hydrogen sulphide.

Action.—Antisuppurative.

B.P. Dose.— $\frac{1}{4}$ to 1 gr. **Max. Dose.**—8 grs.

NON OFFICIAL PREPARATION

1. **Lotio Calcii Sulphurati.** **U.C.H.**—Slaked lime 4, Sublimed Sulphur 4, Distilled Water 35. Boil, evaporate and filter to 20. May cure itch in half an hour when applied after a warm bath. It resembles **Vlemminckx'** Solution (*q.v.*).

PHARMACOLOGY AND THERAPEUTICS

Internally.—Its chief property is to hasten the maturation, and to prevent the formation, of **boils**. It has also been found useful in carbuncles, acne, suppurating glands in the neck, periostitis, alveolar abscess, and inflammatory processes induced by influenza.

Prescribing hints.—It is best given in pills (*see* p. 88). The pills can be obtained ready-made containing each $\frac{1}{12}$, $\frac{1}{10}$, $\frac{1}{8}$, $\frac{1}{6}$, $\frac{1}{4}$, $\frac{1}{3}$, $\frac{1}{2}$ and 1 gr.

ADDITIONAL NON-OFFICIAL DERIVATIVES OF CALCIUM

1. **Calcium Iodate.** **Syn.**—*Calcinol*.—A substitute for iodoform and a gastro-intestinal antiseptic. **Dose.**—3 to 4 grs.

2. **Calc. Carbide.**—In blackish crystalline masses, evolving acetylene gas when moistened with water. Said to check bleeding, fetor, and discharge when applied to inoperable dried ulcerated uterine cancer with a tampon over it.

3. **Calc. Peroxide.** **Syn.**—*Gorit*.—Explodes when moistened with glycerin or formalin. In *acid dyspepsia* of infants. **Dose.**—3 to 9 grs.

4. **Calc. Borate.**—An antiseptic. Useful in *gangrenous ulcers*, *wounds*, and *diarrhæa*. **Dose.**—10 to 15 grs.

CALOTROPIS. Calotropis

N.O. *Asclepiadaceæ.* (*Ind. and Col. Addendum*)

Syn. B.P.—Mudar. **Syn. I. V.**—*Akand shikarer chhāl*, Beng. *Mūdār*, Hind. *Setharka*, Sans.

Habitat.—India and Eastern Colonies.

Source.—The dried root-bark of *Calotropis procera* and of *Calotropis gigantea* (*Seth Akand*) free from outer corky layer.

It should be gathered in April and May from plants grown in sandy soils and dried without the sun before peeling off the bark.

Characters.—In short quilled pieces, $\frac{1}{16}$ to $\frac{1}{2}$ in. thick, $1\frac{1}{2}$ in. wide, covered with soft, greyish, strongly furrowed periderm. This layer *should be removed before powdering*. Odour faint. Taste mucilaginous, bitter, acid.

Composition.—(1) *An active principle* $\text{C}_{17}\text{H}_{28}\text{O}$.

B.P. Dose.—3 to 10 grs. as a tonic; 30 to 60 grs. as an emetic.

OFFICIAL PREPARATION

1. **Tinctura Calotropis**.—Calotropis 2 ozs., Alcohol (60 p.c.) *q.s.* By percolation to 1 pint. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.

PHARMACOLOGY AND THERAPEUTICS

Externally.—The fresh leaves are considered **anodyne** and are usefully applied warmed to painful joints and subacute inflammatory swellings. The fresh juice is a **rubefacient** and **caustic**.

Internally.—In small doses 3 to 10 grs. three or four times a day, the root-bark acts as an **alterative**, **tonic** and **expectorant**, but if given every half hour it is a powerful **nauseant**, **diaphoretic** and **gastro-intestinal irritant**. In 30 to 60 grs. it acts as an **emetic**, causing much nausea.

As an alterative it has been found useful in **chronic rheumatism**, **secondary syphilis** and **incipient leprosy**. The writer has seen good result from its use in a case of incipient leprosy. Its powder has been found successful in **mucous diarrhoea** and **dysentery** and is considered to be a good substitute for ipecacuanha in these diseases. A decoction of the root-bark (1 to 2 ozs.) or a fluid extract of the leaves (1 to 5 ms) is said to arrest **ague**. The flowers are used in **asthma** and **bronchitis**.

CALUMBÆ RADIX

Calumba Root. N.O. *Menispermaceæ*

Habitat.—Eastern Africa, between Ibo and the Zambesi.

Source.—The dried transversely cut slices of the root of *Jateorhiza calumba*.

Characters.—In flattish, circular or oval, centrally depressed pieces, 1 to 2 in. in diameter, $\frac{1}{2}$ to $\frac{3}{4}$ in. or more in thickness; yellowish. Cork brownish, wrinkled; cortex thick with radiating lines.

Identification.—It is easily recognised by the *concave depression* on each side, the dark line running near the edge, the radiating lines of the cork and the characteristic yellowish colouring which becomes more prominent when moistened.

Composition.—(1) *Calumbin*, a whitish crystalline neutral bitter principle. (2) *Berberine*, an alkaloid imparting the yellow colour. (3) *Calumbic Acid*. (4) *Starch*. (5) *Mucilage*. No tannic acid.

Action.—Stomachic tonic.

OFFICIAL PREPARATIONS

1. **Infusum Calumbæ**.—1 in 20 ($\frac{1}{2}$ hour). Infuse in cold water so as to avoid dissolving starch to a great extent. It decomposes in hot weather.

B.P. Dose.— $\frac{1}{2}$ to 1 oz.

2. **Liquor Calumbæ Concentratus**.—1 in 2. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.

3. **Tinctura Calumbæ**.—1 in 10. Brownish. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.

PHARMACOLOGY

Externally.—Calumba may be taken as a prototype of pure vegetable bitters. It is a mild **antiseptic** and **germicide**.

Internally. Mouth.—It is a pure bitter. It stimulates the nerves of taste and reflexly the **salivary and gastric secretions**.

Stomach.—On reaching the stomach it further stimulates the gastric circulation by its direct action on the local nerves, and thereby increases the flow of the gastric juice. Moreover, the gastric mucous membrane is to some extent stimulated by the saliva reaching the stomach as well as by the reflex stimulation through the peripheral nerves of the tongue and mouth. As a consequence of these actions, appetite is sharpened and digestion is improved, as well as assimilation. It is therefore a **stomachic tonic and appetiser**. The efficacy of pure bitters may be increased by combining them with aromatics, or alcohols. Large doses produce opposite effects, *i.e.* diminish the secretions. If continued for long they derange digestion by producing gastric catarrh.

Intestine.—*Calumba* increases the peristalsis to a slighter extent than do aromatic bitters. To a certain extent it moderates decomposition. It is therefore a mild **carminative and antiseptic**. All pure bitters, especially quassia, are **anthelmintics**.

Blood.—Most of the bitters, like the volatile oils, increase the migration of leucocytes into the blood from intestinal glands.

THERAPEUTICS

Internally.—As a most useful *stomachic tonic* it is almost daily used to promote digestion in cases where the stomach participates in the **general enfeeblement** of functional activity caused by various diseases, overwork or starvation. It is especially valuable during the period of convalescence from acute diseases. It is contra-indicated in all diseases of the stomach that are accompanied by pain, vomiting, inflammation or ulceration such as gastritis, gastrodynia, gastric ulcer, gastric cancer. The infusion ($\frac{1}{2}$ pint) may be injected into the rectum for the cure of **thread-worm**.

Prescribing hints.—Bitters should not be given in a concentrated form or for a long period without interruption. *Calumba* is the least irritant of them all, and being free from tannin can be given with iron. If there is a tendency to biliousness it is best given with diluted nitro-hydrochloric acid; or if there be any irritability of the stomach, with alkalis and bismuth salts. It is better to give it 20 to 30 minutes before meals. As the infusion decomposes in hot weather the tincture may be used in its stead: 1 dr. being equal to 1 oz. of the infusion.

CAMBOGIA. Gamboge

N.O. Guttiferae

Habitat.—Siam.

Source.—A gum-resin obtained from *Garcinia hanburi*.

Characters.—In cylindrical solid or hollow rolls, longitudinally striated, or agglutinated masses breaking with a conchoidal fracture. Fractured

surface smooth, reddish-yellow. Powder bright yellow. No odour. Taste acrid. *Solubility*.—Completely by the successive action of alcohol (90 p.c.) and water. *Impurities*.—Starch, mineral matters, and woody fibres.

Composition.—(1) A brilliant yellow *Resin*—*Gambogic Acid*, the active ingredient 75 p.c. (2) *Gum* 15 to 20 p.c.

Action.—Hydragogue purgative. **B.P. Dose**.— $\frac{1}{2}$ to 2 grs.

OFFICIAL PREPARATION

1. *Pilula Cambogiæ Composita*.—1 in 6 nearly. **B.P. Dose**.—4 to 8 grs.

CAMBOGIA INDICA. Indian Gamboge

(*Ind. and Col. Addendum*)

Habitat.—India and Eastern Colonies.

Source.—Gum-resin obtained from *Garcinia morella*.

Characters.—It must have all the important characters and must respond to the tests of the B.P. Gamboge. *Impurities*.—Particles of wood, leaves, and similar extraneous matters. **B.P. Dose**.— $\frac{1}{2}$ to 2 grs.

PHARMACOLOGY

Internally. **Gastro-intestinal tract**.—In medicinal doses it acts as a **hydragogue purgative**, due to increased glandular secretion and peristalsis. In large doses it is an **irritant**, producing vomiting and purging with considerable griping. In toxic doses it causes gastro-enteritis and death. Its action is most marked on the small intestine.

Liver.—No action on the liver, though the presence of bile and fat is necessary for its absorption.

Kidneys.—The resin is absorbed to a small extent and eliminated by the kidneys, rendering the **urine yellow**, and causing slight **diuresis**.

THERAPEUTICS

Internally.—It is rarely prescribed except in **dropsy**, **obstinate constipation**, and **cerebral congestion**. It should not be given to children, old people or in inflamed conditions of the abdominal or pelvic viscera.

CAMPHORA. Camphor. $C_{10}H_{16}O$

N.O. *Laurineæ*

Syn. I. V.—*Karpur*, Beng. *Kafur*, *Kapur*, Hind.

Habitat.—Formosa, Japan, East Indies.

Source.—Obtained from *Cinnamomum camphora*, purified by sublimation.

Chips of wood are distilled and the distilled product deposits crystals of camphor on cooling.

There are three varieties, viz. (1) *Formosa camphor*, (2) *Borneo or Barus camphor*, known in India as *Bhimsaini kapur*, and (3) *Blumea or Ngai camphor*. The second variety is highly prized by the natives and is sold

at a very high price. It is naturally formed in the stems of *Dryobalanops camphora*, grown in Dutch Sumatra, and sinks in water.

Characters.—In solid, colourless, transparent, crystalline pieces of tough consistence; also in rectangular tablets or pulverulent masses—"Flowers of Camphor," sp. gr. 0.995. Odour penetrating. Taste bitter, pungent, followed by a sensation of cold. Burns and volatilises. *Solubility*.—1 in 700 of water, 1 in 1 of alcohol (90 p.c.), 4 in 1 of chloroform, 1 in 4 of olive oil, 1 in $1\frac{1}{2}$ of oil of turpentine. It forms a liquid when triturated with chloral hydrate, menthol, phenol, or thymol.

Action.—Stimulant, antispasmodic. **B.P. Dose.**—2 to 5 grs.

Enters into.—Lint. Aconiti, Lint. Bellad., Lint. Opii, Lint. Sapon., Lint. Sinapis, Lint. Tereb., Ung. Hyd. Co., and the

OFFICIAL PREPARATIONS

1. **Aqua Camphoræ.**—About $\frac{1}{2}$ gr. in 1 oz. *Dose.*—1 to 2 ozs.
2. **Linimentum Camphoræ.** *Syn. B.P.*—Camphorated Oil.—1 in 5 nearly. A yellow oily liquid. *Enters into.*—Lint. Chlorof., Lint. Hydrarg., Lint. Tereb. Acet.
3. **Linimentum Camphoræ Ammoniatum.** *Syn. B.P.*—Lint. Camph. Co.—1 in 8. Faintly yellowish. Rubefacient and counter-irritant.
4. **Spiritus Camphoræ.** *Syn.*—Tr. Camphoræ.—1 in 10. **B.P. Dose.**—5 to 20 ms., on sugar or in emulsion.
5. **Tinctura Camphoræ Composita.** *Syn. B.P.*—Paregoric, Paregoric Elixir.— $\frac{1}{4}$ gr. of opium in 1 dr. Sherry coloured. Expectorant, narcotic. **B.P. Dose.** $\frac{1}{2}$ to 1 dr.

NON-OFFICIAL PREPARATIONS AND DERIVATIVES

1. **Acidum Camphoricum.**—A white crystalline powder slightly soluble in water. In *phthisical night-sweats* and *vesical catarrh*. *Dose.*—10 to 30 grs. in cachets.
2. **Camphor Ball.**—Camphor 2, White Beeswax 5, Spermaceti 3, Almond Oil 3, Tr. of Tolu $\frac{1}{4}$. Melt and pour in $\frac{1}{2}$ oz. gallipots. Applied to *chapped skin*.
3. **Spirit. Camph. Fort.** *Syn.*—*Rubini's Essence.*—Flowers of Camphor 1, Absolute Alcohol 1 (by weight), or a saturated solution in alcohol (90 p.c.) *Dose.*—2 to 5 drops every 15 minutes in *choleraic diarrhœa*.
4. **Oxycamphor.**—A white crystalline powder soluble 1 in 50 of water. In *dyspepsia*. *Dose.*—15 to 30 grs.
5. **Camphor Monobromata.**—In colourless prisms, insoluble in water. A hypnotic and nervous sedative in *hysteria*, *chorea*, *delirium tremens*, and *pht. mal.*, also used in *spermatorrhœa*. *Dose.*—2 to 10 grs. in pill with one-third of its weight of curd soap and proof spirit.
6. **Chloral, Menthol, Phenol, Thymol, and Resorcin Camphors.**—1 in 1. Triturate and heat if necessary. Very useful local anodynes.
7. **Camphoid.**—A solution 1 in 40 of pyroxylin in equal parts of camphor and absolute alcohol. Useful as a vehicle for the application of iodoform, resorcin, chrysarobin, ichthyol, &c. Forms an opaque film which will not wash off.

PHARMACOLOGY

Externally.—Camphor being a stearoptene, acts like volatile oils. It is a feeble **antiseptic** and a direct local **vascular stimulant**,

exciting redness and heat, and is therefore a mild **rubefacient**. It first stimulates then depresses the local nerves causing slight **anæsthesia**.

Internally. Alimentary tract.—It has a peculiar bitter taste and produces a sensation of coldness soon followed by that of warmth in the mouth. It stimulates the local circulation and the secretion of saliva and mucus in the mouth. In the stomach it (1) causes a sense of warmth, (2) dilates the blood-vessels, (3) increases the flow of gastric juice and (4) stimulates the peristaltic movements. It is therefore a **gastric stimulant** and **carminative**. It is also a feeble **antiseptic** and a **reflex excitant** of the heart and the cerebro-spinal centres. In the intestine it acts in the same way.

Heart and circulation.—It enters the blood unchanged from the skin and the mucous membrane, and increases the number of leucocytes, apparently from stimulation of the circulation in the splanchnic area. The heart is stimulated both directly and reflexly, rendering the pulse fuller and stronger without much affecting the number of beats. Large doses weaken and quicken the pulse.

Respiration.—It slightly stimulates the respiration and the bronchial secretion by increasing the vascularity of the bronchial mucous membrane. It is therefore a feeble **expectorant**.

Nervous system.—Its chief action is on the nervous system, but it is a capricious drug. With some it acts as an **exhilarant**, causing agreeable hallucinations with a desire to laugh or dance, and with others as an **intoxicant** or **depressant**. It first stimulates then depresses the **reflex movements** and is therefore an **antispasmodic**.

Skin.—It is excreted with the sweat, which it increases by directly affecting the sweat-centres and locally the sweat-glands.

Metabolism.—We do not know much of its action on tissue-change, except that it reduces the temperature both in health and fever, and that it is excreted in the urine as (1) campho-glycuronic acid and as (2) an amido-derivative. These bodies are formed in the system, the former being a compound of camphorol (one atom of H in camphor is replaced by OH) and glycuronic acid.

Genital organs.—In moderate doses it is said to act as an **aphrodisiac** and in large doses as an **anaphrodisiac**.

Elimination.—It is excreted almost unchanged, by the bronchia, mucous membrane, by the skin and kidneys as complex products, and by the *fæces*.

Acute toxic action.—Poisoning by camphor is rare. The writer has seen only one case of poisoning. Epigastric pain, nausea, sometimes vomiting, giddiness, dimness of sight, delirium verging to mania, epileptiform convulsions, cyanosis, paralysis, cold clammy perspiration, strangury, or arrest of urinary secretion, coma and death.

Antidotes.—Emetics, pump, brisk saline cathartics, cold and hot douches, counter-irritation, sometimes stimulants, and strychnine hypodermically if necessary.

Chronic toxic action.—Young women sometimes make a habit of taking camphor regularly with a view to improve their complexion. This habit if once contracted is very difficult to shake off. Mild form of exhilaration, stupefaction, extreme weakness, and pallor are the chief symptoms.

THERAPEUTICS

Externally.—Being easily obtainable camphor is a favourite domestic ingredient for many liniments, for lessening the pain of lumbago, myalgia and chronic rheumatism. The liniment has been applied to stimulate the absorption of the effused products in sprains and inflammatory swellings of joints, rheumatic or otherwise. The ammoniated camphor liniment and the turpentine and acetic acid liniment are very effective counter-irritants in bronchitis, pleuritis and broncho-pneumonia. Camphor has been dusted on indolent sores and in combination with dusting powders on eczema and intertrigo. Mixed with zinc ointment ($\frac{1}{2}$ dr. to 1 oz.) it allays the itching of eczema genitalis. Dissolved in chloroform and mixed with simple ointment, it has been found to soothe the irritation of piles. Spirits of camphor arrest the progress of boils and bed-sores if applied in the earliest stages. Chloral-Camphor and Menthol-Camphor are most valuable local anodynes in superficial neuralgias.

Internally. **Alimentary canal.**—Mixed with chalk it is often used as a tooth-powder (1 in 8), and with prepared pan as a corrective of foul breath. Chloral-Camphor relieves toothache when put into a carious tooth. Camphor Julep—Mist. (aqua) Camphoræ B.P. 1864—is a domestic carminative for flatulence and colic of children. Spirits of camphor may be given in flatulence and colic of adults. Very few medicines can excel camphor in summer diarrhoea and cholera. It should be given in those cases from the commencement of the illness in 5 to 6 m. doses every 10 or 15 minutes till the symptoms abate and then hourly. It is useless in the later stages. Many consider Rubini's solution more efficient in these cases.

Respiratory tract.—The inhalation of camphor or its use in snuff form relieves coryza and that form of chronic catarrh which is characterised by paroxysmal sneezing. At the same time 5 drops should be given by the mouth every 15 minutes. It is exceedingly useful in chronic bronchitis if given either in the form of Paregoric or in pill form in combination with Hyoscyamus.

Circulation.—Graves recommends camphor in adynamic fevers, saying that it strengthens and reduces the frequency of the pulse, controls the delirium and moistens the skin. In Germany it is considered to be a valuable cardiac stimulant in threatened cardiac failure. The writer often uses camphor and musk together as a cardiac stimulant in the collapse of fevers and other diseases.

Nervous system.—In many spasmodic affections, such as nervous palpitation, chorea, hysteria, whooping cough, &c., it has been given with doubtful results.

Genital organs.—Large doses check inordinate sexual desire and **chordee**. Applied to the breast and given by the mouth in 3 gr. doses, camphor acts as an **antigalactagogue**.

Prescribing hints.—It is best given dissolved in milk (1 dr. in 1 oz.). The essence or Rubini's tincture on sugar or in emulsion. Powdered camphor may be given in pills or cachets. Hypodermically it may be given dissolved in almond oil (1 in 5), in collapse (Binz).

CANNABIS INDICA

Indian Hemp. N.O. *Cannabinaceæ*

Syn. I. V.—*Gānjā*, Beng., Hind.

Hashish is a confection of Hemp.

Gānjā. The flowering tops of the female plants, coated with resin.

Charas is the resin scraped off the leaves.

Bhāng is a drink made from the powdered leaves.

Habitat.—India, chiefly in Bengal.

Source.—The dried flowering or fruiting tops of the female plants of *Cannabis sativa*, grown in India, from which no resin has been removed.

There are three varieties, viz. (1) *flat*, (2) *round*, and (3) *powdered (chur)* Ganja. The last one is best suited for pharmaceutical preparations. *Ganja twenty years old loses all its active properties.*

Characters.—In compressed, rough, dusky-green masses consisting of the branched upper part of the stem bearing leaves and pistillate flowers or fruits matted together by a resinous secretion. Upper leaves simple alternate, 1-3 partite. Lower opposite, digitate. Fruits one-seeded, supported by a bract.

Composition.—(1) An active constituent a *Resin* known best as *cannabinon*. (2) A *Volatile Oil*. (3) An unimportant alkaloid.

Incompatibles.—Water and watery infusions precipitate the resin.

Action.—Deliriant, anodyne, hypnotic.

OFFICIAL PREPARATIONS

1. **Extractum Cannabis Indicæ.**—A rich green resinous extract. **B.P.** Dose.— $\frac{1}{2}$ to 1 gr. *Enters into.*—

2. **Tinctura Cannabis Indicæ.**—1 in 20. 22 ms. contain 1 gr. of extract. Deep green. **B.P. Dose.**—5 to 15 ms. *Enters into.*—Tr. Chlorof. et Morph. Co.

NON-OFFICIAL PREPARATIONS

1. **Cannabinæ Tannas.**—An amorphous yellowish powder sparingly soluble in water. An uncertain hypnotic. Dose.—2 to 10 grs.

2. **Cannabinon.**—A purified resin like treacle. Dose.— $\frac{1}{2}$ to 1 gr. The resin that naturally exudes from the leaves and stem is called **Charas**.

PHARMACOLOGY

Externally.—In the opinion of the writer Indian hemp has a feeble anodyne property.

Internally. Gastro-intestinal tract.—In small doses it sharpens appetite which becomes sometimes so ravenous that it cannot be

appeased by food. It also promotes digestion. If indulged in for long it may cause loss of appetite and gastric derangement. It does not cause constipation or diarrhoea.

Nervous system. (1) *Cerebrum*.—Its chief action is on the cerebral convolutions, resembling in many respects that of alcohol or opium, but is uncertain in its effects. This is due to (a) variations in the strength of the drug and (b) individual peculiarities. In small doses either smoked or taken by the mouth, it causes **pleasurable sensations** with gay, joyful and exalted ideas and a refreshed feeling, particularly after bodily or mental fatigue. Under its influence the knowledge of time and personality is lost. Should it be continued, it causes **intoxication** and loss of self-control. The drugged man becomes very talkative and laughs at everything, passing into a sort of "waking delirium." Hence, it is an **exhilarant** and **deliriant**. The delirium, generally noisy and restless, is accompanied by muscular excitement, and is followed by **sleep**, which is often attended with delightful dreams. Sometimes there is a considerable amount of heaviness in the head and the patient feels "a sensation as of the brain boiling over and lifting the cranial arch." In large doses it induces a sort of **cataplexy**, followed by coma and death from cardiac failure.

(2) *The sensory nerves* are paralysed and there is a sense of tingling and **anaesthesia** of the skin. The muscular sense is also lost, and pain, if present, is lessened or removed. Hence it is an **anodyne**, but is not so powerful as opium or belladonna.

Heart and circulation.—Its action on the heart is uncertain. The pulse may be either first quickened, then slowed, or *vice versa*, probably from its effects on the cardio-inhibitory centre and the heart-substance. The blood-pressure therefore either rises or falls.

Respiration is first quickened and afterwards slowed.

Temperature may rise during the stage of excitement and fall during sleep.

Kidneys.—The secretion of urine is slightly increased from the increased blood-pressure, but prepared *bhāṅg*, *śidhi* or *śabji* produces copious diuresis.

Muscles.—In small doses motor activity is increased and in large doses depressed, owing to relaxation of the muscles. It is therefore an **antispasmodic**.

Genital organs.—In small doses it acts as an **aphrodisiac**, chiefly by stimulating the cerebrum and reflexly the genital centre (see p. 163), and partly by dilating the pelvic blood-vessels. Repeated stimulation of the sexual organs is followed by impotence.

Toleration.—Like opium or alcohol, a tolerance of the drug is soon induced. Habitues may smoke ganja to the extent of about half an ounce or more per diem.

Acute toxic action.—Poisoning by Indian hemp is rather rare. When it occurs, the symptoms are those that have already been alluded to; cataplexy being most important.

Antidotes.—Emetics, or pump if swallowed. Vegetable acids, especially lime juice, cold affusion, stimulants, strychnine, counter-irritation to the nape of the neck.

Chronic toxic action.—Ganja-smoking is very prevalent in India, and if persevered in it causes loss of appetite, emaciation, trembling gait, insanity (mania or melancholia) and mental weakness. **Hashish**, an Arabian aromatic confection of Indian hemp, produces similar effects. **Bhang**—a cold infusion of leaves and fruits with aromatics—is daily indulged in by most of the people of the North-Western Provinces without much deleterious effect.

THERAPEUTICS

Externally.—Mixed with linseed meal (1 in 4), Indian hemp in the form of a poultice has been found by the writer to allay the irritation and pain of **inflamed piles** and **anal fissure**. The dry leaves (*sudhi*) warmed may be used as a fomentation for the same purpose. A watery paste of *charas* relieves **anal pruritus**.

Internally. **Gastro-intestinal tract.**—As an *appetiser* and *stomachic tonic* it has been found valuable in **dyspepsia**, **dyspeptic diarrhoea** and also in some forms of **chronic dysentery**. The natives of this country use *prepared bhang* (*see above*) in these diseases. It has been found to soothe the pain of **gastralgia** and correct the griping property of purgatives.

Respiratory tract.—Either by inhalation or administered internally, it is a valuable antispasmodic in the hacking cough of **phthisis** or the paroxysms of **asthma** or **whooping cough**.

Nervous system. As an *analgesic* Indian hemp is most valuable in **migraine**. In fact, it was the chief remedy for this and other **headaches** before the introduction of phenazone and its congeners. Even now, it is used occasionally with great benefit in **continuous headaches**, especially those occurring at the menopause, or due to worry and fatigue. As a *hypnotic* it is not generally used now, though it has been found sometimes useful in **insomnia**, **delirium tremens** and **mania** when given with bromides. Sir Russell Reynolds strongly recommends the extract ($\frac{1}{4}$ to $\frac{1}{2}$ gr.) in **senile insomnia**. With chloral hydrate it may be serviceable in **chorea**. As an *anodyne antispasmodic*, it is well spoken of in **intestinal**, **biliary** and **renal colics**, **spasm of the bladder** and **chordee**. Its beneficial effects in **tetanus** have been long recognised. The writer can testify to its value from long personal experience.

Genital organs.—In **metrorrhagia**, **spasmodic** and **nervous dysmenorrhœa**, and **ovarian irritation**, it not only relieves the pain but seems to act favourably on the uterine muscular fibres. Occasionally it is used in **subacute gonorrhœa** and **impotence**.

Kidneys.—In acute and chronic **Bright's disease** it has been found to allay pain in the renal region, and remove **hæmaturia**.

Malarious fevers.—The writer believes in its mild **antiperiodic** and **prophylactic** virtues against **malarious fevers**, and expressed

this his opinion before the Royal Hemp Commission held in Calcutta in 1894.

Prescribing hints.—The extract is given in pill massed with liquorice powder. On account of the uncertainty of its composition it is safer to commence with a small dose for toxic symptoms have been produced by one grain. The tincture may be given on sugar or suspended by mucilage of acacia (1 dr. to 1 oz.).

CANTHARIS. Cantharides

N.O. *Coleoptera*

Syn.—Spanish or blistering fly, lytta.

Habitat.—Spain, Italy, Hungary, and Russia. Those from Russia are supposed to be the best.

Source.—The dried beetle, *Cantharis vesicatoria*.

Characters.— $\frac{3}{4}$ to 1 in. long, $\frac{1}{4}$ in. broad, with two long elytra or wing-sheaths of a shining green or coppery-green colour, under which are two thin, brownish, transparent, membranous wings. Odour strong and disagreeable.

Identification.—The entire beetle is easily identified. Its powder can be recognised by its dark brown colour, *offensive odour*, and *shining particles of wing sheaths*. The last two are very characteristic.

Composition.—(1) *Cantharidin*, active principle up to 1 p.c. (2) A *volatile oil*, giving the odour. (3) A *green fixed oil*, the colouring principle, allied to chlorophyll.

Action.—Rubefacient, vesicant, diuretic. *Dose.*— $\frac{1}{10}$ to $\frac{1}{2}$ gr.

Dispensing hints.—A piece of camphor kept with the fly prevents ravages of insects.

OFFICIAL PREPARATIONS

1. **Acetum Cantharidis.** *Syn.*—*Vinegar of Cantharides*.—1 in 10. Dark-brown. Vesicant.
2. **Collodium Vesicans.** *Syn.*—*Blistering Collodion*.—1 in 2. Vesicant.
3. **Emplastrum Calefaciens.** *Syn.* B.P.—*Warming plaster*.—1 in 25 nearly. A firm yellow-coloured plaster. A stimulant application.
4. **Emplastrum Cantharidis.**—1 in 3 nearly. A dark brownish substance. Blisters in from 7 to 9 hours.
5. **Liquor Epispasticus.** *Syn.*—*Blistering Liquid*.—1 in 2. A greenish-brown volatile liquid. Vesicant.
6. **Tinctura Cantharidis.**—1 in 80. A pale straw-coloured liquid. B.P. *Dose.*—5 to 15 ms.; if frequently repeated 2 to 5 ms.
7. **Unguentum Cantharidis.**—1 in 10 nearly. Yellowish-brown. Rubefacient. Milder than Emp. Cantharides. Promotes discharge from a blistering surface.

NON-OFFICIAL PREPARATIONS AND DERIVATIVES

1. **Cantharidin.**—White crystalline scales, soluble in oils, fats, acetic acid and alcohol. A terrible poison. Is used to *promote the growth of hair*.
2. **Anodyne Vesicant.**—*Syn.*—*Boni's Blister*.—Camphor 20, Chloral Hydrate 30. Melt and add cantharides 10. Digest at 150° F. for 1 hour and strain with pressure.

3. **Cantharides Lotion.**—Sp. Ammon. Arom. 2, Glycerin 1, Tr. Canthar. $\frac{1}{2}$, Aq. Rosmarini to 20. *Stimulates the growth of hair.*

4. **Cantharides Hair Oil** (Whitla).—Ol. Rosmarini 4 drs., Liq. Epispastici 2 drs., Ol. Amygdal. Dul. $1\frac{1}{2}$ ozs., Sp. Camph. 2 ozs., Glyc. Boracis 1 oz., Ol. Rosæ 8 drops, Tr. Jaborandi 1 oz. Mix. To be rubbed into the roots for the growth of hair.

5. **Potassi Cantharidas.**—In white needles, soluble in water. Advocated by Liebreich in tuberculosis. *Dose.*— $\frac{1}{400}$ to $\frac{1}{200}$ gr. hypodermically.

PHARMACOLOGY

Externally.—Locally applied to the skin, cantharides does not show any sign of action until after 2 or 3 hours, when tingling and burning are felt on the part, soon followed by redness; referable to the irritation of the local nerves and the dilatation of the local blood-vessels. Vesicles appear next which run together and form one large bleb. Hence it is an **irritant**, **rubefacient** and **vesicant**, but its action is slower than many others of the same class. Cantharidin is freely absorbed by the skin.

Internally. Gastro-intestinal canal.—Unless given in very minute doses well diluted, cantharides causes severe **irritation** of the mouth, fauces, stomach and bowels, producing burning pain in the mouth, throat, and abdomen and vomiting and purging. The vomit and the motions may contain blood. Therefore it is a most powerful **gastro-intestinal irritant**.

Urinary organs.—Cantharidin absorbed from the skin, or stomach and bowels, is slowly excreted by the kidneys, which it stimulates and acts as a **diuretic**. In large doses it causes pain in the loins, and burning and scalding in the bladder and urethra leading to **strangury**, **albuminuria** and **hæmaturia**. These symptoms are due to active inflammation of the glomeruli, which spreads to the cells of the tubules until all the tubes are involved, and to irritation of the fundus and sphincter of the bladder.

Genital organs.—In poisonous doses it inflames the genital organs and causes violent priapism and numerous seminal emissions. It produces **congestion** of the **uterus** and may bring on menstruation or abortion.

Metabolism.—Its effects on tissue-change are not known, but urine which has been previously acid becomes sometimes alkaline after a few blisters. It is also said that blisters promote phagocytosis, causing much absorption of oxygen from the increased passage of air through the lungs (Robin).

Acute toxic action.—Besides the irritant effects on the alimentary and genito-urinary tracts already described, it affects the heart, respiration, and nervous system producing quickened pulse and respiration, headache, mental confusion, loss of sensibility, convulsions, dyspnoea, and death.

Antidotes.—Emetics, pump, mucilaginous drinks, raw eggs. *Oils and fats should be avoided as they increase the solubility of the drug.* Morphine

or opium suppository, and free diluents and Sitz bath to relieve strangury.

Chronic toxic action.—Long-continued small doses cause organic changes almost similar to those that occur in phosphorus poisoning.

THERAPEUTICS

Externally.—Therapeutic indications as a counter-irritant have been fully described in page 144, only some of the specific uses of cantharides are given below :—

1. *To increase local circulation and thereby promote local nutrition*, cantharides is used well diluted in the form of hair-lotions or hair-oils in the **falling off of hair** and **alopecia**. On the same principle it may benefit when painted on **chronic ulcers** or injected into **chronic sinuses** and **fistulae**.

2. *To relieve pain of neuralgias*, blisters should be applied over the posterior branch of the spinal nerve-trunk close to the spine, for if they are put on the seat of pain, they intensify the suffering. In **sciatica** they may be used as flying blisters along the course of the nerve. If pain is caused by a localised inflammation, it is relieved by the direct application of a blister over the seat of inflammation, as in **acute articular rheumatism**.

3. *To promote absorption of morbid products*, blisters may be applied over the joints in **chronic rheumatism**, **synovitis** and **arthritis**; over the chest in **pleuritic** or **pericardial effusions**; over the abdomen in **subacute peritonitis**, **ovaritis**, **pelvic cellulitis**, **chronic thickening** of the intestine caused by dysentery, appendicitis or other affections; over glands in indurated sympathetic **buboes** and **adenitis**.

4. *To reduce inflammation*, a blister should be applied a little away from the seat of inflammation, as in **pericarditis** and **pleuritis** in thin subjects. Counter-irritation behind the ear or high up on the temple reduces inflammation of the eyes, and on the perineum relieves **prostatitis** or **proctitis**.

5. *To arrest spasm and reflex disturbances*, blisters over the epigastrium are very useful in obstinate **vomiting** or **gastric cramp**; and over the pneumogastric in the neck in **whooping cough**.

Internally.—Cantharides is only occasionally used nowadays because it is such a powerful irritant, but it may sometimes be given with benefit, in small doses, for the relief of **chronic gleet** or **chordee**.

Caution.—Cantharides blisters should be avoided or very cautiously applied to children; weak, anæmic and old persons; pregnant women and those who are subject to renal disease, as they may cause strangury. Neither should they be applied to the back of bedridden patients or to paralysed limbs, as they may produce troublesome sores.

Prescribing hints.—To prevent absorption of the cantharidin the cantharides plaster should only be kept on till the vesicles form (about 3 to 5 hours), when a hot poultice will help the rising of a bleb. It is

then generally punctured to let out the serum and dressed with cold cream or vaseline. Savine or cantharides ointment may occasionally be applied to keep up the discharge. Sometimes we apply **flying blisters**, i.e. a series of small blisters, each not larger than a shilling or eight anna bit, kept on for about two hours in one spot, then removed and applied a few inches away for two or three hours, and so on until the affected area is covered. Before applying a blister, the skin should be thoroughly washed with soap and water and rubbed with a towel until the part becomes reddened. The plaster sometimes requires warming before application.

One or two minims of the tincture are enough for an ordinary dose, and it must be freely diluted with mucilage or barley water.

CAOUTCHOUC. India-Rubber

N.O. *Euphorbiaceæ*

Habitat.—Brazil, India.

Source.—The milky juice of *Hevea brasiliensis* and other species; known as pure Para rubber.

Characters.—In elastic masses, brownish-black externally, mottled with a pale tint internally. **Solubility.**—In chloroform, oil of turpentine, carbon bisulphide, benzol, petroleum spirit.

Composition.—It is polymeric with and closely related to terpenes. Combines with sulphur to form vulcanized india-rubber.

OFFICIAL PREPARATION

1. **Liquor Caoutchouc.**—1 in 20. *Enters into.*—Charta Sinapis.

USES

It is used for its physical properties in the preparation of protective coverings.

CAPSICI FRUCTUS. Capsicum

N.O. *Solanaceæ*

Syn.—Small chillies, Guinea Pepper, Pod Pepper. **Syn. I. V.**—*Dhāni Lankā*, Beng. *Gāch Marich*, Hind.

Habitat.—Zanzibar, Sierra Leone, Nepal.

Source.—The dried fruit of *Capsicum minimum*.

Characters.—Dull orange-red, oblong-conical, obtuse, 2-celled, $\frac{1}{2}$ to $\frac{3}{4}$ in. long, $\frac{1}{4}$ in. in diameter, containing 10 to 20 small flat seeds. Odour characteristic. Taste intensely pungent. **Impurities.**—Coloured substances, e.g. red-lead.

Composition.—(1) *Capsicin*, an acrid acid substance. (2) *Capsicinc*, a volatile alkaloid. (3) An *olco-resin*. (4) Fatty matter.

Action.—Rube-facient, stomachic, stimulant. **Dose.**— $\frac{1}{2}$ to 1 gr. in pill.

OFFICIAL PREPARATIONS

1. **Tinctura Capsici.**—1 in 20. Brandy-coloured. **B.P. Dose.**—5 to 15 ms. **Enters into.**—Tr. Chlorof. et Morph. Comp.

2. **Unguentum Capsici.** *Syn.*—*Chillie paste.*—1 in 4½. A reddish-coloured ointment. Stimulant, rubefacient.

NON-OFFICIAL PREPARATIONS

1. **Capsicin.** *Syn.*—*Oleo-Resinæ Capsici.* *U.S.P.* *Dose.*— $\frac{1}{8}$ to $\frac{1}{4}$ gr.
2. **Emp. Capsici.** **U.S.P., B.P.C.**—In *myalgia and sciatica.*
3. **Tr. Capsici Fort. B.P.C.** *Syn.*—*Lin. Capsici.*—Capsicum 10 ozs., Alcohol (90 p.c.) q.s. to 1½ pint. Macerate for 24 hours, then percolate. *Dose.*—1 to 3 ms. Practically it is used externally in swollen *chilblains.*
4. **Ung. Oleo-Resinæ Capsici.** **B.P.C.**—Oleo-resin 1, Yellow Wax $\frac{1}{2}$ Benzoated Lard 4. Melt and mix. A mild counter-irritant. Will bear dilution 3 to 6 times.
5. **Fluid Extractum Capsici.** **B.P.C.**—*Dose.*—1 m.

PHARMACOLOGY

Externally.—The action of capsicum is like that of volatile oils, and to some extent that of cantharides. In other words, it is a powerful **irritant, rubefacient** and therefore **counter-irritant.**

Internally. **Alimentary canal.**—In small doses it stimulates the secretion of saliva and gastric juice and increases peristaltic movements. It is therefore a **sialagogue, stomachic tonic** and **carminative.** In large doses it is a **gastro-intestinal irritant.** The writer once treated a case of acute dysentery brought on by taking a large quantity of capsicum.

It is a cardiac and vascular **stimulant**, feeble **narcotic, diuretic** and **aphrodisiac.** Prof. Cheron thinks that it acts on the blood-vessels like ergot.

THERAPEUTICS

Externally.—Like cantharides, capsicum may be used to promote the growth of hair. The plaster may be applied in **rheumatism, lumbago** or **torticollis.** A piece of lint soaked in an infusion of the pods and covered with oiled silk may be used for the same purpose. The tincture is a valuable remedy for **chilblains.**

Internally.—It is chiefly used as a condiment in India. The tincture mixed with tannic acid (1 dr. of each in water 10 ozs.) makes a useful gargle in **relaxed throat**, simple **tonsillitis** and chronic **pharyngitis.** It is an excellent medicine in atonic and flatulent **dyspepsia** and **dipsomania.** In the last, it not only checks the craving but stimulates and tones the gastric functions. It may induce sleep in **delirium tremens** if the cayenne pepper is given in 20 to 30 gr. doses in a bolus made with honey (Lyons). *Tr. Capsicum* 2 drs., *Sp. Ammon.* Arom. 6 drs., *Sod. Bromid.* 2 drs., *Tr. Cinch. Co.* 4 drs., *Aq. Chlorof.* to 8 ozs. $\frac{1}{2}$ th part every 2 or 3 hours until the craving for drink is removed. The above prescription will generally be found to be an effective "pick-me-up."

CARBO LIGNI

Wood Charcoal (Carbon)

Source and Characters.—A black powder, free from grittiness, prepared by exposing wood to a red heat without access of air.

Action.—Antiseptic, absorbent, deodorizer.

B.P. Dose.—60 to 120 grs.

PHARMACOLOGY

Externally.—Dry charcoal absorbs and condenses gases within its pores, especially oxygen, which it parts with to oxidize organic or other substances either liquid or gaseous. Hence it is a **disinfectant** and **deodorizer**. In the same way it oxidizes colouring matters and is therefore a **decolorizer**. It has no action on living organisms.

Internally.—In the stomach and intestine it absorbs and oxidizes gases and irritating fluids, and thus acts as an **absorbent** and **deodorant**, but this property is lost as soon as it gets thoroughly moistened. But this does not occur very readily and some oxygen is retained in its pores, by which it may exert its influence, though in a less degree, on the gases and fluids in the intestine. Therefore it is a **gastro-intestinal disinfectant**. In large doses it acts as a gentle **purgative**, passing out with the faeces unchanged.

THERAPEUTICS

Externally.—Since the introduction of more powerful antiseptics, charcoal is not much used now. In **phagedænic ulcers** or **gangrene** it may yet be used with advantage in the form of a charcoal poultice.

Internally.—It is often used as a **dentifrice** but it is apt to injure the enamel. It may be given in **flatulent** and **acid dyspepsia**. By removing flatulence, disinfecting faeces and diminishing reflex movements, it may be of use in **diarrhoea**. Jenner recommends it in **enteric diarrhoea**. It is an **antidote** for alkaloidal and phosphorus poisoning.

Prescribing hints.—It may be given in cachets or simply wrapped up in a wafer paper or in combination with soda and pepsin. In poisoning it must be given by table-spoonfuls. Charcoal biscuits are useless for medicinal purposes.

CARBONIS BISULPHIDUMCarbon Bisulphide. CS_2

Syn. B.P.—Carbon Disulphide.

Source.—May be prepared by combining carbon and sulphur at a high temperature and condensing the product.

Characters.—A clear, colourless, highly refractive liquid; odour characteristic. Sp. gr. 1.268 to 1.269. **Solubility.**—1 in 500 of water, readily in alcohol, ether, chloroform, &c. **Impurities.**—Sulphur, sulphuretted hydrogen.

Enters into.—Liq. Caoutchouc and Pil. Phosphori.

ACTIONS AND USES

In pharmacy it is used to dissolve india-rubber and phosphorus. It is an active poison, an antiseptic, and an anæsthetic like chloroform when inhaled.

CARDAMOMI SEMINA

Cardamom Seeds. N.O. *Scitamineæ*

Syn. I. V.—*Elachi*, Beng.

Habitat.—Guzerat, Malabar, Ceylon.

Source.—The dried ripe fruits of *Elettaria cardamomum*. The seeds should be kept in their pericarps and separated when required for use.

Characters.—Commonly known.

Composition.—(1) A *Volatile Oil*, containing a terpene called terpenene.

(2) A *Fixed Oil*. The pericarp is inactive medicinally.

Action.—Carminative, antispasmodic. *Dose.*—5 to 10 grs.

Enters into.—Ext. Colocyn. Co., Pulv. Cinnamomi Co., Pulv. Cretæ Arom., Tr. Gentianæ Co., Tr. Rhei Co., and the

OFFICIAL PREPARATION

1. **Tinctura Cardamomi Composita.**—1 in 80. Deep red colour. **B.P.**
Dose.— $\frac{1}{2}$ to 1 dr. *Enters into.*—Decoc. Aloes Co. and Mist. Sennæ Co.

NON-OFFICIAL PREPARATIONS

1. **Oleum Cardamomi.**—A pale aromatic volatile oil.

2. **Tr. Carminativa. B.P.C.**—Cardamom Seeds 600 grs., Stronger Tincture of Ginger 1½ ozs., Oils of Cinnamon, Caraway, and Cloves each 100 ms., Alcohol (90 p.c.) q.s. to 1 pint. A flavouring agent.

Dose.—2 to 10 ms.

PHARMACOLOGY AND THERAPEUTICS

Internally.—Cardamom seeds are a **stimulant, stomachic** and **carminative**, and are therefore useful in flatulence and in correcting the griping property of purgatives. The tincture is a colouring and flavouring agent.

CARUI FRUCTUS

Caraway Fruit. N.O. *Umbelliferae*

Syn. I. V.—*Jira*, Beng. *Shia-Jira*, Hind.

Habitat.—Europe, India.

Source.—The dried fruit of *Carum carui*.

Characters.—Mericarps separate; each $\frac{1}{4}$ to $\frac{1}{2}$ in. long, $\frac{1}{10}$ in. broad; brown with paler ridges, slightly curved, tapering, glabrous. Odour aromatic. Taste aromatic, agreeable.

Identification.—It resembles Conium and Fennel. Caraway has small ridges and a spicy taste.

Composition.—(1) The *Volatile Oil* (off.).

Action.—Stimulant, antispasmodic, carminative.

Enters into.—Conf. Pip., Pulv. Opi Co., Tr. Card. Co., Tr. Sennæ Co., and the

OFFICIAL PREPARATION

1. **Aqua Carui.**—1 in 10. *Dose.*—1 to 2 ozs.

OLEUM CARUL. Oil of Caraway

Source.—The oil distilled from caraway fruit.

Characters.—Colourless or pale yellow, having the odour and taste of the fruit. Sp. gr. 0.910 to 0.920.

Composition.—(1) *Carvone*. (2) *Carvol*. (3) *Limonene*. (4) *Cymene*. (5) *Cuminol*.

Enters into.—Pil. Aloes Barb. **B.P. Dose.**— $\frac{1}{2}$ to 3 ms.

PHARMACOLOGY AND THERAPEUTICS

The actions and uses are the same as those of *Anethi Fructus* (see p. 242).

CARYOPHYLLUM

Cloves. N.O. *Myrtaceae*

Syn. I. V.—*Labanga*, Beng. *Long*, Hind.

Habitat.—Zanzibar, Penang, Bencoolen, &c.

Source.—The dried flower-buds of *Eugenia caryophyllata*.

Characters.— $\frac{1}{2}$ in. long, dark brown, wrinkled, sub-cylindrical; calyx which tapers below is surmounted by four thick, rigid, patent teeth, between which are four paler imbricated petals enclosing stamens and a single style. Odour strong spicy. Taste pungent, aromatic. *Should emit oil when indented with the finger-nail.*

Composition.—(1) *Volatile Oil* (off.) 18 p.c. (2) *Eugenin*, a crystalline substance. (3) *Caryophyllin*, a neutral body isomeric with camphor. (4) *Gallo-Tannic Acid*. (5) *Gum*, &c.

Action.—Carminative, stimulant, aromatic, tonic.

Enters into.—Inf. Auranti Co., Pulv. Urtæ Arom., and the

OFFICIAL PREPARATION

1. **Infusum Caryophylli.**—1 in 40 ($\frac{1}{2}$ hour).

B.P. Dose.— $\frac{1}{2}$ to 1 oz. *Incompatibles.*—Lime water, iron salts, mineral acids, and gelatin.

OLEUM CARYOPHYLLI

Oil of Cloves

Source.—Distilled from cloves.

Characters.—Colourless or pale when recent, becoming reddish-brown gradually. Sp. gr. not below 1.050.

Composition.—(1) *Eugenol*, chemically resembling phenol. (2) *Acetyl-eugenol*. (3) *Caryophyllene*, a hydrocarbon.

Enters into.—Pil. Coloc. Co., Pil. Coloc. et Hyosc.

B.P. Dose.— $\frac{1}{2}$ to 3 ms.

PHARMACOLOGY

Externally.—Oil of cloves acts like camphor, but causes more tingling, smarting, warmth and redness, followed by anaesthesia. It is therefore

a local **stimulant**, **rubefacient**, **counter-irritant** and **anæsthetic**. It is also a **parasiticide** and **antiseptic**.

Internally. **Mouth.**—The local action of the oil of cloves on the mouth is the same as on the skin. It reflexly stimulates the **secretion of saliva** and **mucus** by exciting the peripheral nerves, and **sharpens the taste** by stimulating the nerves of taste and smell. Simultaneously, the **gastric circulation** is reflexly excited with increased flow of the gastric juice.

Stomach.—On reaching the stomach it directly **stimulates the nerves** and **blood-vessels** of the stomach, thereby **accelerating the secretion** of the **gastric juice** and **stimulating the peristaltic movements**. It is therefore a **stomachic tonic** and **carminative**. Like camphor or alcohol, it also reflexly **stimulates the heart** and moderately increases the rate and force of the pulse.

Intestine.—Some of the oil finding its way into the bowels produces the same action there as on the stomach, causing increased circulation, increased secretion, increased peristalsis and increased expulsion of flatus, but no absorption of gases (Brunton), relieving any spasm, if present. Hence it is an **intestinal antispasmodic**.

Heart, blood and circulation.—It enters the blood unchanged and is partly oxidized by the red blood-corpuscles. It increases the **number of white corpuscles**. The heart may be stimulated to a slight extent by its direct action on it, but chiefly by the reflex action from the stomach. By temporarily exciting the cerebral, medullary and spinal centres either directly through the circulation, or, as is generally the case, reflexly from the stomach, it increases the functional activity of the organs and relieves spasmodic contractions of the various parts of the body. Therefore it is a feeble **general stimulant** and **general antispasmodic**.

Elimination.—The oil of cloves, like other volatile oils, is eliminated by the kidneys, genito-urinary tract, skin, bronchial mucous membrane, liver, and probably the bowels. In its passage through, it **stimulates** and **disinfects** their **secretions** but not so powerfully as turpentine or many other volatile oils.

The above applies more or less to almost all the volatile oils.

THERAPEUTICS

Externally.—On account of its high price oil of cloves cannot be freely used. Occasionally it is applied as an *anodyne* in superficial **neuralgias**. Very often it is employed for flavouring hair-oils and liniments. It is also very useful for **keeping off mosquitoes**, for which purpose a little should be rubbed on to the hands and feet immediately before retiring to rest. In this way it acts as a **pro-phylactic against malaria**.

Internally.—Cloves are generally used in cookery to improve flavour, and with aromatic bitters, as Inf. Aurant. Co., to stimulate appetite and digestion. The oil relieves **toothache** when put into the cavity

of the decayed tooth. It is an excellent remedy for **intestinal colic** and **flatulence**. It may be combined with purgatives to prevent their griping.

Prescribing hints.—The oil is best given on a lump of sugar, or triturated with sugar as *elæosacchara* (see p. 68), or suspended in mucilage.

CASCARA SAGRADA

Cascara Sagrada. N.O. *Rhamnee*

Syn. B.P.—Rhamni Purshiani Cortex, Sacred Bark.

Habitat.—California.

Source.—The dried bark of *Rhamnus purshianus* (California buckthorn).

Characters.—In quilled or flat pieces, 4 in. long, $\frac{3}{4}$ in. wide, $\frac{1}{8}$ in. thick. Cork smooth, purplish-brown, almost covered with lichens. Inner surface reddish-brown, longitudinally striated. Odour characteristic. Taste nauseous, bitter.

Composition.—(1) *Cascarin*, a neutral principle. (2) *Three Resins*—red, yellow, and brown. (3) *Emodin*. (4) *Acids*—tannic, malic, and oxalic. (5) A *Volatile Oil*.

Action.—Tonic, laxative, cholagogue.

OFFICIAL PREPARATIONS

1. **Extractum Cascaræ Sagradæ.**—A dry extract. **B.P. Dose.**—3 to 8 grs.
2. **Extractum Cascaræ Sagradæ Liquidum.**—1 in 1. Black. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.
3. **Syrupus Cascaræ Aromaticus.** *Syn.*—*Cascara Elixir.*—1 in 2 $\frac{1}{2}$. **B.P. Dose.**— $\frac{1}{2}$ to 2 drs.

NON-OFFICIAL PREPARATIONS

1. **Ext. Cascar. Sag. Liq. Insipid.** **B.P.C. Dose.**—30 to 60 ms.
2. **Elixir of Cascara, B.P.C.** *Syn.*—*Cascara Cordial.* **Dose.**— $\frac{1}{2}$ to 2 drs.
3. **Mistura Hepatica.**—Ext. Cascara Liq. 2, Tr. Jalap. 2, Tr. Podophyllin 1, Tr. Gentian. Co. 1, Sal Volatile 1, Aqua Chlorof. 5. **Dose.**—1 to 2 drs. in water.

PHARMACOLOGY

Internally. **Gastro-intestinal canal.**—In small doses (5 to 10 ms.) of the liquid extract, cascara has a decidedly **tonic effect** on the stomach, promoting appetite and helping digestion. In moderate doses ($\frac{1}{2}$ to 1 dr.) it gently stimulates glandular secretion, but its action is upon the peristaltic movements of the bowels. Hence it is a **laxative**, producing healthy, copious and bilious stools, for it is also a **hepatic stimulant**. In large doses it is a **gastro-intestinal irritant**.

THERAPEUTICS

Internally.—Cascara is the most valuable *aperient* we have for **habitual constipation**, due to torpidity either of the liver or of the intestines. The dose ought to be so regulated as to produce a soft,

painless, natural motion every morning, and when the desired end is gained, it should then be gradually reduced. The great advantage of the drug is that the dose does not require to be increased to maintain its action. However, for the successful cure of constipation it must be continued for at least 2 or 3 months.

Prescribing hints.—The solid extract is best given in pills either alone or with *nux vomica* and *aloes*. The nauseous taste of the liquid extract may be concealed by aromatics and glycerin, or aromatics and chloroform. The plain aromatic syrup is not an unpleasant vehicle. The aromatic syrup of cascara is a pleasant preparation. The uncertainty of its action is sometimes most annoying to the physician. This chiefly arises from the use by the manufacturers of inferior bark or the barks of allied species.

CASCARILLA. *Cascarilla*

N.O. *Euphorbiaceæ*

Habitat.—Bahamas Island.

Source.—The dried bark of *Croton eluteria*.

Characters.—In quills, 1 to 3 or more in. long, $\frac{1}{4}$ to $\frac{1}{2}$ in. in diameter or in small curved pieces. Externally dull-brown or dark-grey, longitudinally wrinkled, covered with silvery-grey patches and black dots. Fracture short, resinous. Odour agreeable, aromatic, especially when burned. Taste aromatic bitter.

Identification.—It resembles pale *Cinchona* Bark, which is smooth small, and not so white.

Composition.—(1) *Cascarillin*, a white inodorous crystalline alkaloid. (2) *Betaine*. (3) *Tannic Acid*. (4) *Volatile Oils*. (5) *Starch*. (6) *Resins*.

Incompatibles.—Mineral acids, lime water, metallic salts.

Action.—Aromatic, bitter tonic.

OFFICIAL PREPARATIONS

1 **Infusum Cascarillæ.**—1 in 20 ($\frac{1}{4}$ hour). Decomposes in hot weather.
B.P. Dose.— $\frac{1}{2}$ to 1 oz.

2 **Tinctura Cascarillæ.**—1 in 5. B.P. Dose.— $\frac{1}{2}$ to 1 dr.

PHARMACOLOGY

Internally.—Cascarilla belongs to the group of aromatic bitters, and therefore possesses the combined properties of pure bitters and aromatic oils. It is therefore an **aromatic, stomachic tonic, and carminative**. Some say it is a feeble febrifuge.

THERAPEUTICS

Internally.—It is not unpleasant to take. It is often given in combination with other bitters in flatulent or atonic dyspepsia, and as a *stomachic tonic* after febrile diseases. The bark may be used as a **substitute for tobacco** to wean heavy smokers from the habit.

Prescribing hints.—The infusion will scarcely keep good for a day in the summer unless mixed with an aromatic tincture. Diluted

mineral acids precipitate the resin when given with the tincture, but the addition of the infusion prevents it to a certain extent.

CASSIÆ PULPA. Cassia pulp

N.O. *Leguminosæ*

Syn. I. V.—*Sondâler átá*, Beng. *Amallas*, Hind.

Habitat.—East and West Indies.

Source.—The pulp obtained from the pods of *Cassia fistula*.

Characters.—The pulp viscid, nearly black, with a faint odour, and sweet taste. The pods $1\frac{1}{2}$ ft. to 2 ft. long, $\frac{3}{4}$ to 1 in. in diameter, cylindrical, shortly stalked, blackish brown, divided internally by transverse partitions into numerous cells, each containing a seed surrounded by pulp.

Composition.—(1) A *Purgative principle*, allied to cathartic acid. (2) *Sugar*. (3) *Pectin*. (4) *Mucilage*.

Action.—Laxative. **Dose.**—60 to 120 grs. as a laxative; 1 to 2 ozs. as a purgative.

Enters into.—Conf. Sennæ.

PHARMACOLOGY AND THERAPEUTICS

Internally.—Cassia pulp is never given alone on account of its griping properties, but with senna in the form of a confection.

CATECHU. Catechu

N.O. *Rubiaceæ*

Syn. B.P.—*Catechu Pallidum*, Pale Catechu. **Syn. I. V.**—*Khayer*, Beng. *Kath*, Hind.

Habitat.—Singapore, Eastern Archipelago.

Source.—An extract of the leaves and young shoots of *Uncaria gambir*.

Characters.—In cubes, sometimes agglutinated. Each 1 in. deep, reddish-brown externally, pale cinnamon-brown internally, porous, friable. Taste at first bitter and astringent, then sweetish. No odour. **Solubility.**—Entirely in boiling water, 70 p.c. in alcohol (90 p.c.). **Impurities.**—Earthy matter and starch.

Composition.—(1) *Catechu-tannic Acid*, the active principle which is converted into catechin by boiling or by saliva. (2) *Catechin* or *Catechic Acid*. (3) *Pyrocatechin* or *Catechol*, which gives a green colour with ferric chloride.

Incompatibles.—Alkalis, metallic salts, gelatin.

Action.—Powerfully astringent.

B.P. Dose.—5 to 15 grs.

OFFICIAL PREPARATIONS

1. **Pulvis Catechu Compositus.**—1 in 2½. Stock it in a stoppered bottle. **B.P. Dose.**—10 to 40 grs.; 2 to 5 grs. for a child 1 year old.

2. **Tinctura Catechu.**—1 in 5. A rich coffee-brown liquid. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.; 5 to 10 ms. for a child 1 year old.

3. **Trochiscus Catechu.**—1 gr. in each. In sore throat. **Dose.**—1 to 6.

CATECHU NIGRUMBlack Catechu. N.O. *Leguminosae*

(Ind. and Col. Addendum)

Habitat.—India, Eastern and North American Colonies.**Source.**—An extract prepared from the wood of *Acacia catechu*.**Characters.**—In irregular masses of a dark-brown colour. *Solubility.*—Partially in cold, freely in boiling water.**Actions and Doses.**—The same as those of catechu.**PHARMACOLOGY AND THERAPEUTICS**

Internally.—Both the pale and the black catechu are **non-irritating astringents**, acting like tannic acid which they contain. It is a valuable *local astringent* and may be used in the form of a dentifrice, gargle, or lozenge for **spongy gums, mercurial and ulcerative stomatitis and relaxed throat**. The natives of India suffer little from the diseases of the mouth and gums because of their habit of chewing *prepared pan* (see p. 279), which contains alkaline, astringent (catechu) and antiseptic substances. It is a very useful medicine for **diarrhoea** and in the early stages of **cholera**, being often prescribed with opium, kino and chalk (see p. 297).

CERA FLAVAYellow Beeswax. N.O. *Hymenoptera***Syn. I. V.**—*Mom*, Beng., Hind.**Habitat.**—Britain and other countries.**Source.**—Prepared from the honeycomb of the Hive Bee, *Apis mellifica*.**Characters.**—Firm, yellowish. Odour agreeable, honey-like. Not unctuous to touch. *Solubility.*—Entirely in hot oil of turpentine, partially in alcohol (90 p.c.). *Impurities.*—Starch, paraffin, &c.**Composition.**—(1) *Myricin* (myricyl palmitate). (2) *Cerotic acid*.**Enters into.**—Cera Alb., Emp. Calcifac., Emp. Canth., Emp. Picis, Ung. Hyd. Co., Ung. Menthol, Ung. Picis Liq., Ung. Resinae, and Ung. Staphysagurae.**CERA ALBA. White Beeswax****Source and Characters.**—In white translucent masses or cakes made by bleaching yellow wax by exposure to moisture, air, and light.**Enters into.**—Pil. Phosph., Supposit. Acidi Carbolici, and Ung. Aquae Rosae.**ACTIONS AND USES**

They are chiefly used as a basis for plasters and ointments. If the basis of the latter becomes too soft on account of the prevailing high temperature, extra white beeswax or yellow beeswax may be added to render it more suitable for use.

CEREVISIÆ FERMENTUM. B.P. 1885*(Non-official)***Syn.**—*Fæx Medicinalis.* Beer yeast, *Saccharomyces cerevisiæ*.

Yeast may be administered either in the crude form as obtained from the brewers or as one of the various proprietary dried yeasts, which are sold under the names of **Levurine**, **Cerevisine**, **Zymin**, and **Ceredin**. Ceredin is made up in pills $1\frac{1}{2}$ grs.

Dose.—Of yeast, $\frac{1}{2}$ to 1 oz.; of the dried preparations, a tea-spoonful. Should be given with meals, dissolved either in beer or sweetened water.

NON-OFFICIAL PREPARATIONS

1. **Nuclein.** *Syn.*—*Nucleol.*—Obtained from yeast—a combination of nucleinic acid with albuminates and hydrocarbons. **Dose.**—15 grs. several times daily. Recommended in *tubercle*, *cancer*, and various *septicæmic conditions*. Its value is doubtful. **Tablets.**—1 gr.

2. **Nargol**, **Mercuriol**, and **Cuprol.**—Combinations of Nucleinic acid with silver, mercury, and copper. 5 p.c. solution used in ophthalmic practice.

PHARMACOLOGY AND THERAPEUTICS

It was originally supposed that the active principle of yeast is nuclein which it contains, and that on this account it is both a **leucocyte-stimulant** and **bactericide**. It must be remembered however that in addition to *nuclein* yeast contains many *enzymes*, and that it gives rise to many other products, partly as a result of fermentation and partly by its action upon the metabolism of liver cells. It is undoubtedly a valuable remedy in the treatment of **boils**, **carbuncles** and **acne**.

As regards its use in the treatment of tuberculosis it was at one time in danger of falling into disuse, but recent observations made at Davos Platz have demonstrated the fact that it is of undoubted value in the treatment of cases of **chronic phthisis**, and that it causes a marked rise in the "Opsonic index" of the blood, i.e. it increases the amount of the strange substance which Wright has called "Opsonin," the function of which is to prepare tubercle bacilli for digestion by the leucocytes. It does not cause a leucocytosis, as was formerly supposed. On the contrary, as the opsonic index rises there is a steady fall in the leucocyte count, so that yeast cannot be regarded as a leucocyte-stimulant and it is therefore very doubtful whether nuclein is its active principle.

CERI OXALASCerium Oxalate. $\text{Ce}_2(\text{C}_2\text{O}_4)_3 \cdot 9\text{H}_2\text{O}$

Source and Characters.—A white granular powder insoluble in water obtained by the interaction of soluble cerium salt and a soluble oxalate.

Impurities.—Lanthanum oxalate, didymium oxalate, arsenic, iron, aluminium, zinc, calcium, &c.

Action.—Gastric sedative. **B.P. Dose.**—2 to 10 grs.

PHARMACOLOGY AND THERAPEUTICS

Internally.—It is a **gastric sedative**, but how it acts is not known. It is said to be efficacious in **chronic cough**, and is recommended in **sea-sickness** and the **vomiting of pregnancy**.

Prescribing hints.—The writer has given it in 15 to 20 gr. doses every 3 or 4 hours without much effect. It may be given in cachets, pills or suspended in water.

CETACEUM

Spermaceti. N.O. *Cetacea*

Habitat.—Pacific and Indian Oceans.

Source.—A concrete fatty substance, obtained, mixed with oil, from the head of the sperm whale, *Physeter macrocephalus*. It is separated from the oil by filtration and pressure, and is afterwards purified.

Characters.—In crystalline, pearly-white, glistening, translucent masses with little taste and no odour. Reducible to powder by means of a little alcohol (90 p.c.). **Solubility.**—In ether, chloroform, boiling alcohol (90 p.c.), not in water.

Composition.—(1) *Cetin*, a fat formed by the combination of citylic alcohol with palmitic acid.

Enters into.—Ung. Aquæ Rosæ, Ung. Capsici, and the

OFFICIAL PREPARATION

1. **Unguentum Cetacei.**—1 in 5. An emollient and cooling dressing for blistered surfaces and sores, and for cases where benzoated lard is unsuitable as the eye or piles.

USES

It is chiefly used as a basis for ointments and cerates.

CHIRATA

Chiretta. N.O. *Gentianaceæ*

Syn. I. V.—*Chireta*, Bong. *Chirayata*, Hind. *Bhunimba*, Sans.

Habitat.—Northern India.

Source.—The dried plant, *Swertia chirata*, collected when in flower.

Characters.—Stem 3 ft. or more long, smooth, brown, winged, branched above, rounded below. Branches slender, decussate. Leaves opposite, ovate, glabrous, entire. Flowers small, numerous-panicled. Fruits superior, bicarpellary, unilocular. No odour. Taste extremely bitter. **Impurities.**—*Ophelia angustifolia* (sweet chiretta). *O. alata*, *Andrographis paniculata*, &c. The last is sometimes erroneously called Indian chiretta.

Identification.—It resembles somewhat *Lobelia*, which is not bitter.

Composition.—(1) *Chiratin*, an active amorphous bitter principle in combination with (2) *Ophelic Acid*. No tannic acid.

Action.—Bitter, tonic, stomachic.

OFFICIAL PREPARATIONS

1. **Infusum Chiratae.**—1 in 20 ($\frac{1}{2}$ hour). B.P. Dose.— $\frac{1}{2}$ to 1 oz.
2. **Liquor Chiratae Concentratus.**—1 in 2. B.P. Dose.— $\frac{1}{2}$ to 1 dr.
3. **Tinctura Chiratae.**—1 in 10. Tea-coloured. B.P. Dose.— $\frac{1}{2}$ to 1 dr.

NON-OFFICIAL PREPARATION

1. **Essence of Chiretta.**—As sold in Calcutta, it is an aromatic liquid extract. Dose.—1 to 2 drs.

PHARMACOLOGY AND THERAPEUTICS

Internally.—Being a pure, non-astringent bitter, its actions and uses resemble those of calumba (*q.v.*), but it has some influence on the liver. It is particularly useful in **indigestion** with **torpidity** of the liver and bowels. It can be given with iron. It is often combined with dilute nitro-hydrochloric acid.

CHLORAL HYDRAS. Chloral Hydrate

Trichlorethylidene Glycol. $\text{CCl}_3\cdot\text{CH}(\text{OH})_2$

Source.—(Obtained by the addition of water to the liquid chloral produced by the action of dry chlorine gas on ethylic alcohol.

Characters.—In colourless monoclinic plates. Odour pungent, not acid. Taste pungent, bitter. **Solubility.**—Freely in water, alcohol (90 p.c.), ether, and chloroform. **Impurities.**—Free chlorides, hydrochloric acid, chloral alcoholate, and oily matters.

Identification.—The shape and size of the crystals and the peculiar penetrating odour help recognition. The crystals of butyl-chloral hydrate are smaller though they possess a somewhat similar smell.

Incompatibles.—Alkaline substances which liberate chloroform.

Action.—Hypnotic. B.P. Dose.—5 to 20 grs. Max. Dose.—40 grs. Daily Dose.—90 grs.

OFFICIAL PREPARATION

1. **Syrupus Chloral.**—10 grs. in 1 dr. B.P. Dose.— $\frac{1}{2}$ to 2 drs.

NON-OFFICIAL PREPARATIONS AND DERIVATIVES

1. **Suppositoria Chloral.**—5 grs. in each (*see p. 96*).
2. **Chloral Camphoratum.** B.P.C.—1 in 1. Rub together in a warm mortar until liquefied. An effective local anodyne.
3. **Chloral Camphoratum c. Cocaina.** B.P.C.—Chloral 9, camphor 9, cocaine 2. For *toothache*.
4. **Liq. Bromo-Chloral Comp.** B.P.C.—(*See p. 285*).
5. **Chloralamid.** *Syn.* — *Chloral Formamid.* P.G. — Bitter shining crystals soluble in water. Hypnotic, not analgesic. It does not weaken the heart nor tend to form a habit like chloral. Dose.—15 to 45 grs.
6. **Chlorobrom.**—Contains chloralamide 30 grs. and potassium bromide 30 grs. in 1 oz. flavoured with liquorice. Dose.— $\frac{1}{2}$ to 1 oz.
7. **Chloralose.** *Syn.*—*Anhydro-glyco-chloral.*—Small white crystals prepared by the action of chloral on glucose. Induces dreamy sleep. Not a safe hypnotic. Dose.—3 to 10 grs.

8. **Hypnal.**—A compound of chloral and antipyrine. A sedative hypnotic, useful in cases where there is cough or pain. Contra-indicated in cardiac affections. *Dose.*—15 to 20 grs.

PHARMACOLOGY

Externally.—In a concentrated form it is an **irritant** and **vesicant**. The diluted solution is **antiseptic**.

Internally. **Alimentary canal.**—In large doses chloral hydrate is a **gastro-intestinal irritant**. In medicinal doses well diluted it is not so.

Blood.—It is readily absorbed and circulates unchanged. It is not converted into chloroform and formic acid by the alkalis in the blood, as was originally thought by Liebreich.

Heart and circulation.—Large doses markedly **depress the heart** and finally arrest it in diastole. This is due to its direct action on the **cardiac muscle**. The pulse, after a brief period of excitement, becomes slow, feeble, and intermittent. The **vaso-motor centre** is also **depressed**, causing **dilatation** of the **blood-vessels**. As a consequence of these actions, the **blood-pressure** is considerably **lowered**.

Respiration.—In moderate doses no effect on respiration is observed, but in toxic doses the breathing becomes slower, shallower and irregular, and finally stops with the simultaneous arrest of the heart.

Temperature.—Chloral hydrate tends to lower the body-heat, and in toxic doses there is a marked **diminution of the temperature**, due to (1) the dilated condition of the peripheral vessels and (2) the diminished production of heat in the muscles.

Cerebrum.—In moderate doses, after a transitory excitement it induces a sort of soothing drowsiness soon followed by refreshing sleep indistinguishable from natural slumber; without producing any bad after-effects, such as headache, drowsiness or sickness. Hence it is a pure **hypnotic**. It induces sleep in two ways:—(1) directly, by lessening the activity of the brain-cells and (2) indirectly, by dilating the vessels throughout the body and somewhat lessening the force of the heart. Larger doses cause prolonged sleep leading to coma. The **pupils** are **contracted** by small doses and in large doses they first contract, then dilate.

Spinal cord.—The **anterior cornua** are first **stimulated**, then **powerfully depressed**, with abolition of **reflex excitability**. Probably chloral acts first on the grey matter, as painful impressions are not felt when reflex excitation can still be induced (Brunton).

(1) *Motor nerves and muscles* are not affected directly.

(2) *Sensory nerves* are not affected unless very large doses be given.

Thus it will be seen that chloral hydrate is a **powerful depressant** to (a) the *cerebrum*, (b) the *respiratory centre*, (c) the *vaso-motor centre*

(d) the *anterior cornua of the cord*, (e) the *heart*, and (f) possibly the *thermogenetic centre* (?).

Kidneys.—It escapes partly unchanged, but chiefly as urochloralic acid. Large doses cause nephritis and hæmaturia. There may also be glycosuria.

Elimination.—It escapes chiefly by the kidneys and partly by the lungs and skin.

Acute toxic action.—Acute poisoning is rare. The writer has seen only one case—a habitual drunkard who died after taking 80 grs. The symptoms are profound sleep merging into deep coma; lividity of the face; pallor; cold sweat over the forehead and head; slow, laboured, and afterwards shallow and feeble breathing; frequent, feeble, and irregular pulse; *marked fall of temperature*, which may be so great as alone to cause death (Branton); pupils contracted and afterwards dilated; and absolute muscular relaxation. Death takes place from paralysis either of the heart or of the respiratory centre.

Antidotes.—Emetics or pump. Friction; external warmth; stimulants, such as ammonia, ether, &c.; sinapisms over the chest and nape of the neck; electricity; amyl nitrite inhalation; atropine, strychnine, caffeine hypodermically. The patient if he can be roused should not be allowed to sleep, a pint of strong coffee may be injected into the rectum, as recommended by Murrell.

Chronic toxic action or Chloralism.—Craving for Chloral is soon generated in those who are addicted to its use. Gastro-intestinal disturbance; cutaneous eruptions, such as erythema, pustules, vesicles, &c.; bodily and mental weakness; sudden flushing; dyspnoea and palpitation are prominent symptoms. Death often results from an over-dose. The best treatment is the gradual withdrawal of the daily dose with generous diet, fresh air, tonics and nerve sedatives, such as hyoscyamus.

Physiological antagonists.—Atropine, strychnine, physostigmine, picrotoxin.

THERAPEUTICS

Externally.—As a *vesicant*, powdered chloral hydrate may be sprinkled over a gently warmed adhesive plaster and applied. It produces an effective painless blister. As a *local anodyne* Chloral Camphor or Chloral c. Menthol may be painted over superficial **neuralgic areas**, and applied within **carious painful teeth**. The efficacy of any of these combinations may be greatly augmented by the addition of morphine or cocaine. A lotion (8 grs. to 1 oz.) is an antiseptic, anodyne, stimulating application to **unhealthy or foul ulcers**, and may cure **eczema**.

Internally.—As a *pure and simple hypnotic* it is unrivalled in **sleeplessness** due to worry, overwork or old age, but not to pain. In doses of 15 to 20 grs. it induces a refreshing sleep, which thus obtained not infrequently leads to the repeated use of the drug and thereby induces the **chloral-habit**. It is very efficacious in **febrile insomnia** in the early stages, but must be given cautiously in the later stages

when there is danger of cardiac failure. It is a most valuable remedy for **delirium tremens**. In combination with bromide of potash it will often check the disease in the early stages. The method of administration is as follows :—During the day 20 grs. of sulphonal, dissolved in a glass of warm milk or broth, should be given every 3 hours, then at 8 P.M. administer 20 grs. of chloral with 20 grs. of potassium bromide and repeat the dose every 2 hours as long as the patient remains awake. If this produces sleep, the patient may wake up perfectly cured. But it must not be continued for too long lest it produces fatal results by depressing the heart already weakened by alcoholic excesses. In the same manner it may be given in **mania**, **puerperal** or otherwise. It is much extolled in **sea-sickness** and **vomiting of pregnancy**. As a *depressant to the motor tracts of the cord and a paralyser of reflex excitability*, it is a very valuable drug in convulsive diseases, particularly in **puerperal eclampsia**, **tetanus**, **strychnine-poisoning**, **hydrophobia**, **tetanus neonatorum**, **infantile convulsions** when given with bromides. The addition of a few drops of the tincture of Indian hemp to the chloral and bromide mixture has given very satisfactory results in tetanus in the writer's hands. Many other spasmodic affections, such as **chorea**, **asthma**, **whooping cough**, **paralysis agitans**, **spasmodic intestinal colic** are benefited by it. It is an excellent medicine for lessening the **rigidity** of the **os** and other soft parts during parturition. It does this without affecting the uterine contractions. Chloral hydrate subcutaneously injected (5 to 10 grs.) removes cramps in **cholera**, but the injection causes burning, inflammation, and sometimes suppuration. As a *general anodyne* it is far inferior to morphine, though it may relieve mild attacks of **neuralgias** of any nerve except the fifth (*see* butyl-chloral hydrate), it also lessens the pain in **urinary**, **biliary** and **intestinal colic**; and in **gastrodynia**. By referring to the following table, the student will be better able to understand the difference between the actions and uses of chloral hydrate and morphine :—

Chloral Hydrate

1. A quicker, a more certain, and a more refreshing hypnotic.
2. No after-effects, such as headache, depression, and sickness. (Sometimes heaviness or sleepiness only.)
3. No constipation. No gastrointestinal derangement in medicinal doses.
4. Cannot relieve excessive pain nor induce sleep in insomnia caused by it
5. Cannot relieve reflex cough, but can relieve convulsive diseases.

Morphine

- A slower, a more uncertain, and a less refreshing hypnotic.
- Always headache, confusion, and narcotism.
- Always constipation, and sometimes nausea.
- Can relieve pain and induce sleep in insomnia caused by it.
- Can relieve reflex cough, but cannot relieve convulsive diseases.

Caution.—Being a powerful cardiac depressant, it should be given with great caution to old, gouty, rheumatic, hysterical, delicate, and otherwise constitutionally weak persons. It should not be given to confirmed drunkards, except when absolutely necessary for the treatment of delirium tremens. It is contra-indicated in diseases of the heart, blood-vessels and lungs, and in nephritis. In a person susceptible to its action, small doses (10 to 15 grs.) may sometimes produce redness of the eyes and conjunctivitis.

Prescribing hints.—The aromatic or ginger syrup best covers its pungent taste. It may be given by the rectum (*see p. 96*) or subcutaneously (*see above*).

CHLORUM. Chlorine. Cl. (*Non-official*)

This gas is usually obtained from Calx Chlorinata and Liquor Sodæ Chlorinatæ. Acidum Nitro-hydrochloricum dilutum contains some free chlorine.

CALX CHLORINATA

Chlorinated Lime. $\text{CaCl}_2, \text{CaCl}_2\text{O}_2$

Syn.—Bleaching powder.

Source.—Obtained by exposing slaked lime to chlorine gas until absorption ceases. Should contain not less than 33 p.c. of chlorine $2\text{CaH}_2\text{O}_2 + 2\text{Cl}_2 = \text{CaCl}_2\text{O}_2 \cdot \text{CaCl}_2 + 2\text{H}_2\text{O}$.

Characters.—A dull white powder with a characteristic smell. Becomes moist and gradually decomposes on exposure to air. *Solubility*—Partly in water.

Dispensing hints.—It should be preserved in well-stoppered bottles.

Enters into.—The preparation of chloroform and the

OFFICIAL PREPARATION

1. **Liquor Calcis Chlorinatæ.**—1 in 10. Yields when fresh 3 p.c. of Cl. Antiseptic, deodorizer. Preserve it in a stoppered bottle in a cool and dark place.

LIQUOR SODÆ CHLORINATÆ

Solution of Chlorinated Soda. $\text{NaCl}, \text{NaClO}$

Syn.—Labarraque's disinfecting fluid.

Source and Characters.—A colourless alkaline liquid with an astringent taste and odour of chlorine, obtained by mixing a solution of sodium carbonate with one of chlorinated lime. $\text{CaCl}_2\text{O}_2 \cdot \text{CaCl}_2 + 2\text{Na}_2\text{CO}_3 = (\text{NaCl} \cdot \text{NaClO})_2 + 2\text{CaCO}_3$.

Dispensing hints.—Preserve it in a stoppered bottle in a cool and dark place.

Action.—Antiseptic, disinfectant. **B.P. Dose.**—10 to 20 ms.

NON-OFFICIAL PREPARATION OF CHLORINE

1. **Liquor Chlorig** (Burney Yeo).—Put powdered potassium chlorate 30 grs. into a 12 oz. bottle and pour over it strong hydrochloric acid 1 dr.,

cork, shake, and allow gas to generate, then add water by degrees shaking after each addition. Into this solution dissolve 24 to 36 grs. of quinine and 1 oz. of syrup of orange peel. *Dose*.—1 oz. every 2, 3, or 4 hours in *typhoid fever*.

PHARMACOLOGY

Externally.—Chlorine has a great affinity for hydrogen, and consequently decomposes chemical and organic compounds which contain it, such as ammonia, sulphuretted hydrogen, and many organic matters. It also destroys putrefactive and septic germs. Hence it is a powerful **disinfectant** and **deodorant**. Applied to the skin for a long time, as in the case of workmen in a manufactory of bleaching powder, it causes itching, redness and inflammation, leading even to vesication or sloughing. Inhaled in a concentrated form it is a powerful irritant to the respiratory passages and may cause death from spasm of the glottis or inflammation of the air-passages. Inhaled greatly diluted with air, it is a stimulating **expectorant**.

Both chlorinated lime and chlorinated soda are powerful **disinfectants** and **deodorizers**, because they give off hypochlorous acid—an active oxidizing agent. Being unstable, the acid is soon decomposed and liberates chlorine and oxygen. The former greedily attacks hydrogen, and the latter the oxidisable constituents of many chemical and organic substances with which it may come in contact. On this account Liq. Calcis Chlorinatæ is used in testing for **indicanuria**.

Internally.—It exerts the same local influence on the parts with which it comes in contact, until decomposed into chlorides in the stomach, when it loses its virtues as an uncombined element.

THERAPEUTICS

Externally.—As a *disinfectant* and *deodorizer*, chlorinated lime is often poured into drains, privies, urinals, bed-pans, &c. Moistened with water it may be put in saucers in different parts of a sick-room to disinfect the air. If the room requires a speedy disinfection, chlorine gas may be quickly generated by pouring sulphuric acid on salt and black oxide of manganese; the room being closed up for 24 hours. The chlorine thus liberated attacks the hydrogen of the ammonia and sulphuretted hydrogen present in the atmosphere of the room.

As a *stimulating antiseptic application*, chlorine water or a solution of chlorinated lime or of chlorinated soda may be used for **wounds** and **ulcers** which have a fetid discharge or a tendency to slough. It is also useful for injecting into **cavities** with **foul discharges**.

As a *parasiticide* any of the solutions may be found useful in **ring-worm** and **scabies**.

Internally.—In **malignant sore throat**, **diphtheria**, **mercurial salivation**, and **sloughing stomatitis**, either of the solutions may be used with advantage as a gargle ($\frac{1}{2}$ to 1 dr. to 1 oz.). A solution of chlorine is recommended in septic diseases, such as **typhoid fever**

and septicæmia, but the results are not encouraging. Burney Yeo's chlorine mixture has not proved successful in the writer's hands, though it relieves flatulence. The great drawback to its use is its extremely nauseous taste.

CHLOROFORMUM. Chloroform

Trichloro-methane. CHCl_3

Source.—May be prepared by heating a mixture of chlorinated lime, slaked lime, ethylic alcohol, and distilled water. Sufficient absolute alcohol is added to make the sp. gr. 1.490 to 1.495.

Characters.—A limpid, colourless, heavy, volatile liquid; not inflammable. Odour sweet, penetrating. Taste sweet, pungent. *Solubility.*—1 in 200 of water, 10 in 7 of alcohol (90 p.c.), freely in ether and most fixed and volatile oils. (Chloroform dissolves caoutchouc, mastic, elemi, tolu, benzoin, copal, iodine, organic alkaloids, &c. *Impurities.*—Hydrocarbons, non-volatile compounds including chlorides left after evaporation; carbonyl chloride from age and exposure to light; free acids; free chlorine.

Tests for purity.—(1) It should neither turn blue litmus paper red (absence of acids); nor (2) produce a white precipitate except a slight opalescence with AgNO_3 (absence of chlorides); nor (3) afford any colour with cadmium iodide and starch (absence of chlorine); nor (4) a yellow colour with H_2SO_4 (absence of hydrocarbons); nor (5) any residue and unpleasant odour after evaporation; and nor (6) a change of colour with potash (absence of aldehydes).

Identification.—It is recognised by its characteristic *smell*, weight, and volatility (*see* Ether, p. 211).

Dispensing hints.—It should be kept in blue or amber coloured stoppered bottles in a cool and dark place, as it decomposes in the presence of light and air in combination.

Action.—Anæsthetic, sedative, carminative, antispasmodic, rubefacient, anodyne. **B.P. Dose.**—1 to 5 *ms*.

OFFICIAL PREPARATIONS

1. **Aqua Chloroformi.**— $\frac{1}{4}$ m. in 100. Powerfully antiseptic. *Dose.*— $\frac{1}{2}$ to 2 *ozs*.
2. **Linimentum Chloroformi.**—1 in 2. Rubefacient and anodyne.
3. **Spiritus Chloroformi.** *Syn.*—*Chloric Ether, Spirit of Chloric Ether.*—1 in 20. A sweetening agent. **B.P. Dose.**—5 to 20 *ms*. for repeated use; 20 to 40 *ms*. for single dose.
4. **Tinctura Chloroformi et Morphine Composita.**—A substitute for Chlorodyne. Antispasmodic, narcotic. Chloroform $\frac{3}{4}$ m.; Morphine Hydrochlor. $\frac{1}{10}$ gr.; Acid. Hydrocyan. dil. $\frac{1}{2}$ m. in 10 *ms*. **B.P. Dose.**—5 to 15 *ms*.

NON-OFFICIAL PREPARATIONS

1. **A.C.E. Mixture.**—Alcohol (90 p.c.) 1, Chloroform 2, Ether 3. Mix. A safer and yet an effective general anæsthetic in protracted operations. Should be dropped on an open mask.

2. **Chloroformum Camphoratum.** **B.P.C.**—Camphor 2, Chloroform 1. Dissolve. A useful local anodyne in *toothache*.

3. **Tr. Chlorof. Comp. B.P.C.**—Chloroform 2, Alcohol (90 p.c.) 8, Tr. Card. Co. 10. Mix. *Dose*.—5 to 60 ms.

4. **Camphorodyne.**—A substitute for **Chlorodyne**.—Pulv. Camph. 1 oz., Chloroform 2 ozs., Ol. Menth. Pip. $\frac{1}{2}$ oz., Tr. Cannab. Ind. 2 ozs., Tr. Capsici $1\frac{1}{2}$ ozs.; mix and set aside. Morph. Hyd. 32 grs., Acid. Hydrochloric. dil. $\frac{1}{2}$ oz., Distilled Water to 1 oz.; mix by the aid of heat and set aside. Acid. Hydrocyanic. dil. 1 oz., Mucil. Acacia B.P. $1\frac{1}{2}$ ozs., Treacle 5 ozs., Syrup B.P. q.s.; mix and add the two previous mixtures (lastly the camphor). Shake and add syrup to 16 ozs. *Dose*.—15 to 30 ms.

PHARMACOLOGY

Externally.—Like alcohol or ether, chloroform when allowed to evaporate constricts the local blood-vessels and paralyses the peripheral sensory nerves, and is therefore a powerful **local refrigerant** and **anæsthetic**. If evaporation be prevented or if it be rubbed into the skin, it causes **rubefaction** and if the application be prolonged it may lead to **vesication**.

Internally. **Mouth.**—In a concentrated form, it is a local **irritant**, producing a hot burning sensation. Well diluted, it has a **warm sweetish taste**. It is a local **anæsthetic** and a **reflex excitant** of the **salivary secretion**.

Stomach and intestine.—Chloroform acts like alcohol or ether on the stomach. In medicinal doses it produces (*a*) a sensation of warmth in the epigastrium, (*b*) an increased gastric vascularity, (*c*) an increased flow of the gastric juice, and (*d*) increased but regular peristaltic movements of the stomach and intestine. Hence it is a **stomachic tonic** and **carminative**. In the intestines it has a slightly **sedative** and **astringent** effect, especially when given in the shape of chlorodyne. In large doses it is a **gastro-intestinal irritant**, causing vomiting and purging, followed by stupor, coma and abolition of reflex sensibility.

Heart and circulation.—It readily enters the blood from the respiratory tract, stomach, abraded surfaces and when subcutaneously injected. We do not know what changes occur in the blood; probably a portion of it is decomposed. In medicinal doses, given by the mouth, it certainly **strengthens the cardiac contractions**, but its effect though more rapid than that of alcohol passes off more speedily. Long-continued administration causes enfeeblement of the heart, but no change in the pulse rate, except in the last stage when the heart becomes dilated and its rhythm irregular. The **blood-vessels** and **capillaries dilate** after complete anæsthesia from **paralysis** of the **vaso-motor centre**.

Respiration.—During the administration of chloroform, respiration is at first slowed, then quickened, and afterwards it again slows down but it remains steady. Finally it becomes not only slow but irregular and at last it stops altogether.

Nervous system.—Chloroform acts on the **nervous system** in somewhat the same manner as alcohol, but its action is more rapid and it appears to derange the mental faculties from the beginning. It follows the two laws already described on page 157. For convenience of description, its action on the nervous system may be divided into **four stages** :—

First Stage, or that of **Imperfect Consciousness**.—This begins with a feeling of warmth on the surface, sounds in the head, flashes of light before the eyes, choking or suffocation or sometimes cough (especially if the vapour is concentrated), and confusion of ideas. Sounds are faintly heard, questions are imperfectly answered, and pain, if present, is not much felt, indicating a blunting of the general sensibility.

Second Stage, or that of **General Stimulation**.—The patient is no longer conscious of external impressions, but according to temperament, he may sing, cry, shout, or struggle (hence some authors call this “the struggling stage”). At times the struggling is so hard that the patient holds his breath, the face becomes livid, the eyes protrude and the jugular veins distend. Almost coincidently the **lower centres are stimulated**; the pulse becomes frequent, the heart and large vessels throb, respiration becomes quickened, blood-pressure rises and the pupils become slightly dilated.

Third Stage, or that of **Anæsthesia**.—This is characterised by the *paralysis of the nerve-centres which have previously been excited, and the abolition of reflex action and sensation*. If the inhalation is continued, the patient becomes completely unconscious: his limbs quite flaccid, and if one of them is held up it falls like that of a corpse; only a sluggish contraction of the iris follows when the eyes are suddenly exposed to light; the **pupils are contracted**; and the **conjunctival reflex is completely abolished**. The pulse falls in volume and frequency, respiration becomes slow and deep, sometimes stertorous, and the blood-pressure falls from paralysis of the vaso-motor centre. This is the **proper stage for operation**. 1 to 4 drs. of chloroform is generally necessary to bring about **complete anæsthesia**.

Fourth Stage, or that of **Paralysis**.—If chloroform is pushed further, the **lowest reflex centres are paralysed**, causing a **complete loss of muscular tone**, so that the patient passes urine and stools involuntarily, and all the muscles become completely flaccid. Sometimes the surgeon is obliged to push the inhalation to this extent, to enable him to reduce dislocations or to examine abdominal viscera through the abdominal wall. If the inhalation is still continued, the **pupils dilate**, which is an *indication of the commencement of asphyxia* and of paralysis of the **vaso-motor, respiratory and cardiac centres**. It is therefore an important “*danger-signal*.” The **blood-vessels and capillaries now dilate** and the **blood-pressure falls to zero**. Respiration becomes shallower, weaker and irregular and often stops before the arrest of the heart. The pulse grows feeble and intermittent, and finally the heart stops in diastole.

Causes of death under chloroform.—There has been much controversy as to whether death takes place from the heart or from the lungs. The two Commissions appointed by the Nizam of Hyderabad came to the conclusion that respiration fails before the heart. But the correctness of this view has been strongly disputed. According to Hare the cause of death is the extreme fall of blood-pressure, as the result of which a large amount of blood accumulates in the dilated capillaries, and the heart stops because there is no blood for it to contract upon. Be that as it may, death may occur from (1) *the arrest of respiration*, due either to the paralysis of the respiratory centre or to mechanical causes; from (2) *direct paralysis of the heart from shock*, which may happen in any stage without warning; or from (3) *a sudden failure of both the heart and respiration at any stage*.

Summary of actions.—Chloroform affects the nervous system in the following order:—first, the cerebrum including the mental faculties; secondly, the sensory part of the cord; thirdly, the motor tract of the cord; fourthly, the sensory paths of the medulla, leading to abolition of reflex excitability; fifthly, the centres in the medulla, particularly the respiratory and the vaso-motor; and lastly the cardiac muscle. This order is sometimes altered; for instance, the heart may be paralysed before the respiration.

Recovery from chloroform anaesthesia takes place in the reverse order. The lowest functions (*e.g.* the muscular tone) reappear first, then after a while the consciousness, and lastly the mental equilibrium.

Involuntary muscles and peripheral nerves.—The involuntary muscles are not obviously affected, for the parturient uterus contracts under chloroform narcosis. The peripheral nerves are affected only a little before death.

Vomiting is very liable to occur during the administration of chloroform, its advent being heralded by pallor of the face, cold sweats, and dilatation of the pupils.

THERAPEUTICS

Externally.—As a *local anodyne* chloroform is far inferior to other agents, though it may be combined with them with advantage, as it promotes absorption through the skin of many substances, *e.g.* the alkaloids. Hence the chloroformic liniments of aconite, and belladonna, or a mixture of the liniments of aconite, belladonna and chloroform (*see* p. 207) may be applied in **myalgia, lumbago, chronic rheumatism, pleurodynia and pleurisy**. If rubefaction or counter-irritation is desired, the liniment of chloroform may be sprinkled over a piece of folded cloth or lint and covered with oiled silk. Two or three drops of chloroform on a pellet of cotton-wool introduced into the ear relieve **toothache or faceache**. The pain of **cancer and pruritus pudendi** may be temporarily relieved by the use of the chloroform spray. In the form of an ointment (1 dr. to 1 oz. of lard) it may be used to allay the itching of **prurigo, lichen and urticaria**. A deep hypodermic

injection (10 ms.) near the sciatic nerve relieves **sciatica** but cocaine is better for this purpose.

Internally. Gastro-intestinal tract.—A pledget of cotton-wool soaked in chloroform and introduced into the cavity of a painful carious tooth relieves **toothache**. It is an excellent medicine for disguising the unpleasant taste (*see* p. 116) of many drugs. One to three drops of chloroform may check **vomiting**, **sea-sickness** and **flatulent distension**. In **diarrhoea** or in the beginning of **cholera**, spirit of chloroform may be usefully given with opium or other astringents. Chlorodyne and camphorodyne are also very efficient remedies in these cases. Chloroform is very serviceable in **intestinal** and other **colics** because of its *antispasmodic effect*. It is usual to give it in those cases with opium or morphine.

Heart.—As a *diffusible cardiac stimulant* it is generally given in depressed conditions of the system or spirits, nervous exhaustion, &c.

Respiratory tracts.—Combined with opium or morphine it allays many **coughs**, especially if they are paroxysmal or violent.

Inhalation.—Besides its internal uses, chloroform may be given as an inhalation in the following cases:—

1. *To produce anaesthesia during surgical operations.*
2. *To relax muscular spasm* during the reduction of **dislocations** or **hernias**, the setting up of **fractures**, or during **catheterisation**.
3. *For the purpose of diagnosis*, as in the case of young children or hysterical subjects. For the examination of abdominal viscera or to ascertain whether a particular swelling is a real or a phantom tumour.
4. *To relieve the intense pain of certain diseases*, such as **biliary**, **intestinal** and **renal colics**, **neuralgias**, &c.
5. *To relieve the spasms* of many convulsive diseases, such as **tetanus**, **strychnine poisoning**, **hydrophobia**, **puerperal eclampsia**, **chorea**, **uraemia**, &c. The distressing dyspnoea of **asthma** and of **aneurism**, and the violence of the paroxysms of **whooping cough** and **hiccough** may be lessened by the inhalation of a few drops poured on to a handkerchief.
6. *To relieve suffering or to relax the rigidity of the os or other soft parts during parturition*, a moderate inhalation may be given with benefit during the pains, but only after a full dilatation of the os.

Administration of chloroform.—There are **two methods** of administering chloroform almost without danger. The first is to give it in small quantities well diluted, gently and cautiously increasing the strength; and the second is to administer it in large doses more or less concentrated. Each of these plans has its advantages. The former takes a longer time and causes no shock, while the latter takes a shorter time; and if there is any shock at all, it is induced at a time when the system can best bear it.

The following practical hints should be particularly attended to while administering chloroform :—

1. Chloroform should be perfectly **pure**. The A.C. (alcohol and chloroform) mixture or A.C.E. mixture is only indicated in cases where there is a fatty or weak heart, or where the operation is likely to be a protracted one (*see* p. 340).

2. No **solid food** should be given for at least six hours before the administration. Morning is the best time for chloroforming, as the patient then is in a refreshed condition and may easily be kept without food.

3. All **tight clothes** about the neck, chest, and abdomen should be removed or materially loosened. Attendants' or dressers' hands should not press upon the chest or abdomen while holding the patient.

4. Artificial teeth should be removed.

5. The safest position of the patient is the dorsal decubitus.

6. As the **undivided attention** of the chloroformist is essential for the safety of the patient, the operator should not undertake to administer the chloroform and to operate at the same time.

7. Chloroform should be freely diluted with air.

8. An ordinary handkerchief or a piece of lint folded in the form of an open cone within which some absorbent cotton has been stitched is the best inhaler in the absence of Junker's apparatus which does not allow a greater concentration of chloroform than 5 per cent. If a cone is used it should not be held either too close to, or too distant from, the mouth and the nose. The proper distance throughout the inhalation is the nearest which does not cause choking, struggling, or holding of breath.

9. If the patient is weak, a small dose of brandy or whisky may with advantage be given before the inhalation is begun.

10. If lint is used, not more than 20 or 30 ms. should be sprinkled on to it at a time. Some anaesthetists prefer to commence with double this dose, so as to lessen the period of excitement.

11. Pay particular **attention** to the breathing, as most of the accidents are caused by respiratory failure. Irregularity of breathing is generally caused by insufficiency of air, which makes the patient struggle or hold his breath.

12. No operation should be commenced until the patient is under **complete anaesthesia**, as shown by the absence of the corneal reflex. The administration should never be pushed to the stage of stertorous breathing and complete relaxation of muscles, except when it is absolutely necessary as for the reduction of old-standing dislocations.

13. Directly the **corneal sensibility is lost** or **respiration becomes stertorous**, the **inhalation must be suspended**. In case the stertor comes on while the cornea is still sensitive, the inhalation should not be proceeded with, as it invariably happens that the cornea becomes insensitive within a few seconds afterwards.

14. The patient's head should invariably be turned to one side, the lower jaw depressed and the tongue drawn forward if necessary during vomiting, so that no vomited matter may enter the larynx. Should this accident happen laryngotomy must be at once performed.

15. **Pallor of the face** is best controlled by lowering the head and giving amyl nitrite inhalation.

16. Special care should be taken during an operation on the mouth to prevent any blood flowing down into the larynx. Full anaesthesia may

be maintained by introducing chloroform vapour into the post-nasal space through a soft catheter connected with the Junker's inhaler; or by injecting morphine subcutaneously before the inhalation.

17. **Lividity of the face** and deep **stertor** should at once be controlled by raising the shoulders, opening the mouth, and pulling out the tongue. If breathing threatens to stop or stops altogether, artificial respiration according to Silvester's plan should immediately be commenced and at the same time the fingers may be thrust under the ribs to mechanically stimulate the heart. Artificial respiration should be maintained for at least an hour or so, and if there be any sign of returning life, it should be continued for several hours. In addition to the above measures, hypodermic injections of strychnine, ether, and brandy, the inhalation of nitrite of amyl, bandaging of the limbs, compression of the abdominal aorta and lowering of the head should all be tried.

Treatment after inhalation.—No food should be given for at least two hours after inhalation. Teed soups or jellies and ice milk with soda water may be given during the next 12 hours. Vomiting may be checked by the sucking of lumps of ice or by a tea-spoonful of burnt brandy.

Dangers during administration.—Broadly speaking they may arise from two sources; *viz.*—(1) failure of respiration, and (2) failure of the heart, as detailed below:—

1. Death from suffocation may be caused by:—

(a) *Obstruction of the glottis* by falling back of the tongue, or the sucking in of vomited matter or blood.

(b) *Spasm of the glottis* from the inhalation of chloroform vapour, which is either too strong or contains irritating products of decomposition.

(c) *Mechanical impediments to respiration*, due to either (1) **constrained position of patient**, as in obstetric and renal operations; (2) **pressure of tight clothes or bandages** or the **assistant's arms**; (3) **falling in of the lips and alæ nasi**, as in old people who have lost their teeth; (4) **spasmodic holding of the breath**, especially in nervous patients and during the early stages of the administration.

(d) *Paralysis of the respiratory centre* caused either by the administration of too concentrated vapour, or of chloroform vapour along with carbonic acid, as may occur if the cone be kept too close to the mouth and nose without allowing the ingress of air.

2. Death from the stoppage of the heart may occur from:—

(a) *Excessive concentration of chloroform vapour*, causing sudden paralysis of the cardiac muscle.

(b) *The shock of operation*, reflexly stopping the heart. This may happen even in trivial operations, especially if anaesthesia be incomplete.

(c) *Diseases of the heart.* The heart is apt to fail if it is fatty, dilated or structurally disorganised. Therefore it is risky to administer chloroform to the old, the infirm, the anæmic, drunkards, epileptics, and those who suffer from valvular diseases. For them ether is the safest anaesthetic. A.C.E. mixture or the simultaneous inhalation of oxygen and chloroform vapour may also be resorted to in carefully selected cases (see p. 213).

Self-administration of Chloroform should always be discouraged, but it is occasionally necessary, as in cases of difficult labour, where there is no skilled assistance available. A pledget of cotton-wool may then be placed in the bottom of a tumbler, and some chloroform poured on to it. This should then be given to the patient with instructions to inhale deeply. No harm can possibly occur because as soon as she begins to lose consciousness she drops the tumbler and the inhalation comes to an end.

CHRYSAROBINUM. *See* p. 252

CIMICIFUGÆ RHIZOMA

Cimicifuga. N.O. *Ranunculaceæ*

Syn. B.P.—*Actææ Racemosæ Radix*. Black snake-root.

Habitat.—United States, Canada.

Source.—The dried rhizome and roots of *Cimicifuga racemosa*.

Characters.—*Rhizome* 2 to 6 in. long, $\frac{1}{2}$ to 1 in. thick, hard, cylindrical, with remains of stout ascending branches marked with encircling leaf-scars. *Roots* brittle. Odour faint. Taste bitter, acrid.

Composition.—(1) *A Volatile Oil*. (2) *Two Resins*. (3) *Gallie and Tannic Acids*. *Cimicifugin* is an impure resin precipitated from the tincture.

Action.—Stomachic tonic, cardiac tonic, and antihæmatic.

OFFICIAL PREPARATIONS

1. **Extractum Cimicifugæ Liquidum.**—1 in 1. **B.P. Dose.**—5 to 30 ms.
2. **Tinctura Cimicifugæ.**—1 in 10. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.

PHARMACOLOGY

Internally.—It has a peculiar action. In small doses, it is a **stomachic tonic** like the vegetable bitters, and a **cardiac tonic** like digitalis. In large doses, it causes vomiting, it **depresses the heart** like aconite, it **paralyses the sensory tracts of the cord** thereby lowering reflex excitability, and it **increases the bronchial secretion**. It affects the **uterus** like ergot producing rhythmical contractions, and not throwing the organ into a state of tonic spasm.

THERAPEUTICS

Internally.—It is not much used. As a *stomachic tonic* it may be given in **dyspepsia** accompanied with neuralgic pain. It is very much praised in **chronic rheumatism**, **lumbago**, **pleurodynia**, and **chorea** especially when there is also a rheumatic tendency. It is recommended in **irritable and fatty heart**, **dysmenorrhœa**, **amenorrhœa**, **headache**, **sciatica** and **chronic bronchitis**. It is a drug of very doubtful utility and it deteriorates rapidly on keeping.

CINCHONÆ RUBRÆ CORTEX

Red Cinchona Bark. N.O. *Rubiaceæ*

Habitat.—South America. Cultivated on the Nilgiris and in Sikkim. Burma, Central India, Ceylon, Java, &c.

Source.—The dried bark of the stem and branches of cultivated plants of *Cinchona succubra*.

Besides the official, there are several varieties of bark from which quinine is extracted. About thirteen kinds of cinchona are grown in the Government plantations in India.

Characters.—In quilled or incurved pieces, coated with periderm; 2 in. to 1 ft. or more long, $\frac{1}{8}$ to $\frac{1}{2}$ in. thick; outer surface reddish-brown, rough from longitudinal ridges, transversely cracked and warty; inner surface brick-red, coarsely striated. Fracture shortly fibrous. Powder brownish or reddish-brown. No odour. Taste bitter, somewhat astringent.

Impurities.—Barks of inferior quality.

Tests.—It should yield 5 to 6 p.c. of total alkaloids, of which half should consist of quinine and cinchonidine. The process for their estimation is given in the B.P. (which see).

Composition.—The bark contains the following:—

A. *Four important alkaloids.*—(1) *Quinine*, as a hydrate. (2) *Cinchonine*. (3) *Quinidine*. (4) *Cinchonidine*.

B. *Three acids.*—(1) *Chinic* or *Quinic Acid*, closely allied to benzoic acid. (2) *Chinoric Acid*. (3) *Cinchotannic Acid*.

C. *One glucoside.*—*Chinorin*, which easily splits up into chinovic acid and glucose.

D. *One colouring ingredient.*—*Cinchona Red*, almost insoluble in water.

E. *One Volatile Oil* which gives the bark its smell.

Incompatibles.—Ammonia, lime water, metallic salts, and gelatin. In practice it is combined with acids, alkalis, iron, and digitalis.

Action.—Bitter tonic, astringent, antiperiodic. *Dose.*—5 to 60 grs.

OFFICIAL PREPARATIONS

1. **Extractum Cinchonæ Liquidum.**—5 grs. of alkaloids in 110 ms Standardized. A brownish liquid. **B.P. Dose.**—5 to 15 ms.

2. **Infusum Cinchonæ Acidum.**—1 in 20 (1 hour). **B.P. Dose.**— $\frac{1}{2}$ to 1 oz.

3. **Tinctura Cinchonæ.**—1 gr. of alkaloids in 110 ms. Standardized. Reddish-brown. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.

4. **Tinctura Cinchonæ Composita.** *Syn.*—*Huxham's Tincture of Bark*— $\frac{1}{2}$ gr. of alkaloids in 110 ms. Standardized. Red. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.

NON-OFFICIAL PREPARATIONS

1. **Decoctum Cinchonæ.** **B.P. 1885.**—Bark 1 $\frac{1}{2}$, Distilled water q.s. to 20. Boil for 10 minutes. *Dose.*—1 to 2 ozs.

2. **Cinchona Febrifuge.**—Prepared and sold by the Government of India. It has an average percentage of crystallizable quinine 15.5, cinchonine 33.5, cinchonidine 29, amorphous alkaloid 17, colouring matter 5. Though a valuable antiperiodic and febrifuge, it causes nausea, vomiting, and derangement of bowels.

3. **Cinchonidine Sulphas.**—In colourless silky crystals soluble in water. *Dose.*—1 to 10 grs.

4. **Cinchonine Sulphas.**—In colourless prismatic crystals soluble in water. *Dose.*—1 to 10 grs.

5. **Mistura Antidipsomania, N.H.W.**—Tr. Cinchon. 1 dr., Glycerin $\frac{1}{2}$ dr., Tr. Capsici 3 ms., Decoct. Cinchon. to $\frac{1}{2}$ oz.

PHARMACOLOGY AND THERAPEUTICS

Internally.—Cinchona bark is an **astrigent bitter tonic**, a **febrifuge** and a **mild antiperiodic**, due to the alkaloids and other ingredients it contains. The crude bark irritates the stomach and bowels. It is often prescribed with other vegetable bitters during convalescence from an acute febrile attack, or along with quinine salts to increase their antiperiodic property. On account of its astrigent and antiperiodic virtues, it is often used with benefit in **diarrhoea** and **dysentery** accompanied with malarial fever. Combined with Spiritus Ammoniae Aromaticus, the compound tincture makes an excellent "Pick-me-up." It also checks the craving for strong drinks.

QUININÆ HYDROCHLORIDUM

Quinine Hydrochloride. $C_{20}H_{24}N_2O_2 \cdot HCl, 2H_2O$

Syn. B.P.—Hydrochlorate of Quinine, B.P. 1885.

Source.—Obtained from the bark of various species of Cinchona and Remijia.

Characters.—In crystals like those of quinine sulphate, but somewhat larger. **Solubility.**—1 in 35 of cold and freely in boiling water, 1 in 3 of alcohol (90 p.c.).

Action.—Antiperiodic, antipyretic, tonic. **B.P. Dose.**—1 to 10 grs.

OFFICIAL PREPARATIONS

1. **Tinctura Quininæ.**—2 grs. in 110 ms. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.
2. **Vinum Quininæ.**—1 gr. in 1 oz. **B.P. Dose.**— $\frac{1}{2}$ to 1 oz.

QUININÆ HYDROCHLORIDUM ACIDUM

$C_{20}H_{24}N_2O_2 \cdot 2HCl, 3H_2O$

Source.—The same as that of hydrochloride of quinine.

Characters.—A white crystalline powder. **Solubility.**—In less than its own weight of water. Reaction acid. **B.P. Dose.**—1 to 10 grs.

QUININÆ SULPHAS. Quinine Sulphate

$\{(C_{20}H_{24}N_2O_2)_2, H_2SO_4\}_2, 15H_2O$

Source.—The same as that of quinine hydrochloride.

Characters.—Filiform, silky white crystals; taste intensely bitter. **Solubility.**—1 in 800 of water, giving the solution a bluish fluorescence; entirely in water acidulated with a mineral acid. **Impurities.**—Cinchonine, quinidine, cupreine or amorphous alkaloid, lime, chalk, magnesia, starch. It should not yield more than a total of 3 p.c. of cinchonidine.

Cinchonine, quinidine, and cupreine are not present in the quinine sulphate of any reliable manufacturer. Cupreine is only present if *cuprea* or *Remijia* bark is used.

Tests.—Aqueous solutions of quinine salts yield with solution of ammonia white precipitates, soluble in ether, and in excess of the solution

of ammonia. When such aqueous solutions are treated first with solution of bromine or of chlorine and afterwards with solution of ammonia, they become of an emerald-green colour, changing to red when mineral acids are added. Exposed to dry air, quinine sulphate effloresces, until the 15 molecules of water have been reduced to 4. It affords the reactions characteristic of sulphates, 2.5 grammes of freshly prepared salt should lose .38 gramme of water by drying at 212° F. Heated to redness with free access of air, it burns without leaving any residue (absence of mineral impurity).

For tests for *cinchonidine*, *cinchonine*, *quinidine*, *cupreine*, and *amorphous alkaloids* see the B.P. 1898, pp. 227-8.

Incompatibles.—Alkalis and their carbonates, astringent infusions.

B.P. Dose.—1 to 10 grs.

Enters into.—The preparation of *Ferri et Quin. Citras*, *Syr. Ferri Phosph.* c. *Quin.* at *Strych.*, and the

OFFICIAL PREPARATIONS

1. **Pilula Quininae Sulphatis.**—5 in 6. **B.P. Dose.**—2 to 8 grs.
2. **Tinctura Quininae Ammoniata.**—2 grs. in 110 ms. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.

NON-OFFICIAL PREPARATIONS AND DERIVATIVES OF QUININE

1. **Quininae Albuminas.**—54 p.c. of quinine. Amorphous.
2. **Quin. Arsenas.**—*Dose.*— $\frac{1}{2}$ to $\frac{1}{4}$ gr. in *malaria*.
3. **Quin. Carbolas.**—A crystalline salt containing 77 p.c. of anhydrous quinine. In *diarrhoea*. *Dose.*—1 to 5 grs.
4. **Quin. Chloras.**—In white needles slightly soluble in water. *Dose.*—1 to 5 grs.
5. **Quin. Citras.**—Like sulphate. *Dose.*—1 to 5 grs.
6. **Quin. Ethylcarbonas.**—*Syn.*—*Euquinine*, *Euchinine*.—In crystals sparingly soluble in water. An excellent substitute for quinine sulphate. May be given to children in milk or soup as it is not so bitter. *Dose.*—3 to 15 gr.
7. **Quin. Fluoridum.**—Reduces enlarged spleen and fever. *Dose.*— $\frac{1}{10}$ to $\frac{1}{4}$ gr.
8. **Quin. Glycerophosphas.**—Two kinds, *viz.* basic and neutral. In obstinate *neuralgia* or *chronic malaria*. *Dose.*—3 to 8 grs.
9. **Quin. Hydrobromidum.**—In white acicular crystals, soluble in water. Used as an antipyretic and antiperiodic. With excess of diluted hydrobromic acid it lessens cinchonism. *Dose.*—1 to 5 grs. or more.
10. **Quin. Hydrobrom. Acidum.**—Yellowish crystals, very soluble in water. Used hypodermically. *Dose.*— $\frac{1}{2}$ to 2 grs.
11. **Quin. Hydrochloro-Carbamidum.**—*Syn.*—*Urea Quinine*.—Soluble in water. Used hypodermically in cholera in 12 to 15 gr. doses.
12. **Quin. Hydrochloro-Sulphas.**—Soluble 1 in 2 of water. Used for hypodermic purposes. *Dose.*—1 to 10 grs.
13. **Quin. Hypophosphis, Quin. Phosphas.**—*Dose.*—1 to 6 grs.
14. **Quin. Iodas, Quin. Hydriodidum, Quin. Hydriod. Acidum.**—In *chronic rheumatism* and *tubercle*. *Dose.*—2 to 5 grs.
15. **Quin. Lactas.**—A granular white amorphous powder soluble in water. Suitable for internal and hypodermic use. *Dose.*—1 to 5 grs.
16. **Quin. Oleatum.**—1 in 3 of Oleic Acid. Readily absorbed when applied externally.

17. **Quin. Salicylas.**—Silly, acicular crystals sparingly soluble in water. In *remittent fever, rheumatism, neuralgia, and diarrhoea*. Dose.—2 to 6 grs.

18. **Quininæ Acetyl-Salicylas.** *Syn.*—*Xaraquin*.—3 gr. tablets are prepared. Dose.—1 to 5 grs.

19. **Quin. Sulphas Acidus.** *Syn.*—*Neutral Quinine Sulphate*.—Soluble 1 in 12 of water. For hypodermic injection. Dose.—1 to 10 grs.

20. **Quin. Sulphocarbolas.**—An amorphous white powder. Dose.—1 to 6 grs.

21. **Quin. Tannas.**—An amorphous, whitish-yellow powder. Not so bitter, suitable for children. In *fever with diarrhoea*. Dose.—1 to 4 grs.

22. **Quininæ Formas.**—A general tonic. Dose.—1 to 5 grs.; 1 to 3 grs. subcutaneously.

23. **Quin. Tartas.**—Sparingly soluble. Used hypodermically.

24. **Quin. Valerianas.**—In nervous *headache* and *hysteria*. Dose.—1 to 4 grs.

25. **Quinetum.**—The mixed alkaloids from the East India red cinchona bark. The sulphate is like quinine sulphate. Dose.—1 to 10 grs.

26. **Quinoidin.** *Syn.*—*Chinoidinum*.—A mixture of alkaloids mostly amorphous obtained as a by-product. Dose.—1 to 5 grs.

27. **Quinolin.**—Obtained by distilling quinine or cinchonine with aqueous potassium hydroxide, or synthetically. Antiseptic. Dose.—5 to 15 grs.

28. **Quinosol.** *Syn.*—*Potassium Oxychinolin Sulphate*.—Antiseptic, disinfectant, and deodorant. Acts better in solution than in powder. Dose.—1 to 5 grs.

29. **Warburg's Tincture.** *Syn.*—*Tinctura Antiperiodica*. *B.P.C.*—Take in grains, Alocs Soc. 240, Rhubarb 80, Angelica Fruit (*Archangelica officinalis*) 80, Elecampane Root (rhizome and root of *Inula helennium*, Linn.) 40, Saffron 40, Fennel 40, Prepared Chalk 40, Gentian 20, Zedoary Root (root of *Curcuma zedoaria*) 20, Cubebs 30, Myrrh 20, White Agaric (the white fungus *Polyporus officinalis*, Fries) 20, Opium 2½, Black Pepper 4, Cinna-mon 8, Ginger 8, Alcohol (60 p.c.) *q.s.* Macerate for seven days in one pint of alcohol, press, filter, and dissolve in the product Quinine Sulphate 175 grs., Camphor 20 grs. After three days filter and add alcohol *q.s.* to one pint. Dose.—1 to 4 drs.

30. **Saloquinine.**—A Quinine Salicylic Acid-ester. A tasteless substitute for quinine. Dose.—15 to 45 grs. per diem, as an analgesic; up to 90 grs. per diem in malaria.

31. **Aristochin.** *Syn.*—*Aristoquinine*.—The neutral carbonic ester of quinine in white tasteless powder containing 96 p.c. of quinine. Is insoluble in water. Dose.—8 to 15 grs.

PHARMACOLOGY

Externally.—Quinine sulphate, ordinarily called quinine, is an active poison to many low forms of vegetable and animal life. Even a weak solution of quinine (1 gr. to 1 oz. of water) kills many active infusoria, bacteria and protozoa. According to Binz a solution (1 in 20,000, i.e. 1 gr. in 46 ozs. of water) destroys paramœcia in hay infusions in two hours. In small doses it diminishes and in large doses arrests **fermentation** due to organized ferments, but it has no action on the conversion of sugar by ptyalin or diastase. Hence it is a

powerful **antiseptic and disinfectant**. It does not affect the healthy skin, but irritates an abraded surface.

Internally. Mouth.—It is a pure vegetable bitter, and has an intensely persistent bitter taste if taken in neutral or slightly acid solution, as the alkaline saliva precipitates the alkaloid. Like other bitters it **reflexly stimulates the salivary secretion** by exciting the gustatory nerves; but, if it is injected into the duct of the sub-maxillary gland, it checks its secretion either by paralysing the ends of chorda tympani or the secreting cells. The sympathetic fibres are not affected except in very large doses, consequently the secretion of thick ropy saliva is not prevented.

Stomach and intestine.—All quinine salts are, in the stomach, converted into a hydrochloride, which being soluble, is easily absorbed. In small doses (1 to 2 grs.) it is a bitter **stomachic tonic** like calumba (see p. 304), and indirectly it acts as a general and cardiac tonic. In large doses (15 to 40 grs.) it produces the opposite effects—depression and gastro-intestinal irritation. It is not easily absorbed from the intestine as it is precipitated by the alkaline succus entericus.

Blood.—After absorption into the blood, quinine has several specific actions which may best be described under the following heads:—

1. *White corpuscles.*—Quinine paralyses the movements of the white blood-corpuscles. This may be seen by mixing a drop of the solution with a drop of fresh blood under a microscope. If quinine be injected into a blood-vessel, it at once stops the emigration of the leucocytes; but it has no effect on the amœboid movements of those which have already passed out into the tissues. This action was at one time considered very important and quinine was regarded as a valuable means of checking the formation of pus: with our present knowledge, however, of the rôle played by the leucocytes in the process of suppuration it is clear that this action, if it were exerted at all, would be the reverse of beneficial as it would interfere with the first line of defence of the organism against bacterial infection. According to Binz, quinine not only checks the movements of the leucocytes; it actually destroys them.

2. *Red corpuscles.*—These are not materially affected, though many assert that it increases their number and causes an *increase* in their size. In large doses the opposite effect is produced. It is in fact a hæmolytic.

3. *Hæmoglobin.*—The oxyhæmoglobin is made a stable compound, consequently the blood cannot either absorb or give up oxygen so readily as in health. Probably this does not occur in medicinal doses.

4. *The oxidizing power* of the blood is considerably affected as will be evident from the following experiment. If tincture of guaiacum be added to ozonic ether (a solution of hydrogen peroxide in ether), no blue colour appears, because guaiacum resin has not sufficient

affinity for oxygen, but the addition of a drop of blood to this mixture gives a blue colour at once, indicating that blood has the power of taking up oxygen from ozonic ether and of transferring it to the guaiacum. Quinine added to the blood checks this oxidizing influence.

5. *Acidity of blood*.—Ordinarily fresh drawn blood turns acid after a while, but the addition of quinine checks this change.

6. *The malarial parasite*.—Under the administration of quinine malarial parasites (*Plasmodium malarie*) disappear from the peripheral circulation. This action is exercised at the moment when, as the result of sporulation, the young parasites are set free in the blood-plasma, and it has probably very little power of destroying *crescent forms*. The utility of quinine in arresting malarial fever is therefore due to its acting as a protoplasmic poison to the plasmodium and not to its action on the leucocytes.

Heart and circulation.—Small doses reflexly stimulate the heart through the stomach, but large doses directly paralyse it; the pulse becomes slow and feeble, and at last the heart stops in diastole. It is not definitely known whether this action is due to its influence on the muscular fibres or on the motor ganglia of the heart. The blood-pressure is increased by small doses, and is very much lowered by larger doses, owing to its depressing influence on the heart and on the vaso-motor centre.

Respiration.—It is not affected by small doses, but is quickened by moderate doses, and in toxic doses it is first slowed then arrested. The gaseous interchanges are checked.

Liver and spleen.—It has no action on the liver, but contracts the recently enlarged spleen.

Temperature.—Quinine has very little effect upon the temperature in health, but causes a marked reduction in fevers, particularly if they are of malarial origin. It is therefore an antipyretic on account of (1) diminished oxidation, (2) lessened tissue metamorphosis, and (3) its specific action on the malarial parasites.

Nervous system.—Small doses have a tonic effect upon the nervous system, but large doses produce a train of symptoms known as cinchonism (*q.v.*).

Cerebrum.—Small doses stimulate and large doses depress the functions of the brain. Sometimes the motor centres are excited, causing epileptic fits.

Cord and nerves.—Quinine does not affect the functions of the cord and nerves in man, though it reduces reflex activity in frogs.

Uterus.—Quinine occasionally acts as an **ecbolic**, and it certainly intensifies the labour pains or re-establishes them if they are absent, when parturition has already commenced. Menstruation is sometimes induced by quinine in non-pregnant women. Metrorrhagia is an occasional symptom, although given after labour it often stops hæmorrhage. The notion that the administration of quinine in

pregnancy is highly dangerous is a mistake. Very large doses are frequently taken without causing any ill effects. Indeed one often sees abortion result from an unchecked fever, which might have been avoided by the timely administration of quinine.

Urinary tract—Quinine is excreted by the kidneys very slowly, continuing for several days, though rapidly during the first forty-eight hours. The amount of nitrogenous products, such as urica, uric acid, &c., is diminished. In many cases it irritates the bladder and the urethra.

Skin.—It escapes, though slightly, through the skin and does not seem to increase the perspiration, except in malarial pyrexia. It produces papular, erythematous and scarlatiniform rashes (see p. 149).

Elimination.—It is eliminated with the urine, sweat, milk, saliva, bile, tears, dropsical fluid and fæces.

Toleration.—Some persons are very susceptible to the action of this drug. Even a small dose may produce cinchonism, particularly headache and ringing in the ears. The writer has seen a female who became collapsed after taking 5 grs. of quinine sulphate.

The rôle of quinine in the production of black water has not yet been definitely settled. A case of death following the administration of fifteen grains of quinine has recently been reported, the symptoms leading to this result being profuse internal and external hæmorrhage. A case recently occurred when intense urticaria followed the administration of the soluble hydrochloride, later of equinine, but not of aristochm, under which recovery ensued.

Cinchonism.—A single large dose (20 grs.) or small doses frequently repeated cause ringing in the ears, frontal headache, slight deafness, and dimness of vision. In larger doses these symptoms are intensified, with the addition of staggering gait, and muscular and cardiac weakness.

Acute toxic action.—It is rarely taken as a poison. If it is, the above symptoms are further intensified. The patient becomes deaf, blind, delirious, and collapsed, and may die either from cardiac or respiratory failure, or from convulsions.

THERAPEUTICS

Externally.—Quinine cannot be freely used on account of its cost, though it is a *powerful antiseptic*. A lotion (2 to 4 grs. in 1 oz. of water) has been found very efficacious in **diphtheritic conjunctivitis**, and as an injection in **hay fever, otorrhœa, and chronic cystitis**. A diluted solution preserves meat, milk, butter, urine, &c.

Internally.—As an *antiseptic* it may be used as a gargle in **stomatitis, diphtheritic ulceration and sore throat**.

As a *stomachic tonic* it is very useful in convalescence from an acute illness, particularly malarial fever. Its efficacy is considerably increased if it is combined with mineral acids and other bitters.

As an *antipyretic* it is far inferior to phenazone, phenacetin, acetanilide or sodium salicylate, but there are many who advocate its use in

10 to 20 gr. doses in **typhus, typhoid and puerperal fever, acute rheumatism, insolation and pyæmia**. It must be given just before the natural defervescence. It is useless in hyperpyrexia.

As an *antiperiodic* and *febrifuge* it is considered almost a specific for **ague, malarial fever** and all **intermittent and remittent affections**. A few of them require more than a passing notice:—

(1) *Ague*.—Being a direct poison to the malarial parasite, quinine acts as a specific in ague. A single large dose of 10 to 20 grs. should be given at least two hours before the expected paroxysm. It will then have been absorbed into the blood before sporulation takes place and will thus quickly attack the young spores when they are discharged into the plasma and before they are able to enter into the red corpuscles. An emetic or a cholagogue purgative, preferably the latter, should be given before the administration of quinine. The administration of repeated small doses is the customary plan in this country, but the writer considers a single large dose of 10 grs. two hours before a fit, and 3 or 4 small doses during intermission, are more efficient in many cases than small doses alone. In many obstinate cases, he gives two large doses, one at the beginning of defervescence and the other two hours before the expected fit. It is useless to administer the powdered drug in excessively large doses as it is not absorbed. In fact quinine should always be given in solution and never in the form of pills or tablets. In whichever way it is given, it should be continued as a *prophylactic* for some time in 2 to 5 gr. doses three times a day. Some advocate a large dose (15 grs.) every fifth or sixth day for this purpose.

(2) *Enlargements of the spleen*.—With the cure of ague the size of the spleen is reduced, but the efficacy of quinine is greatly augmented if it is given with iron as in the following prescription:—Quin. Sulph. 2 grs., Ferri Sulph. $\frac{1}{2}$ gr., Pulv. Rhei 5 grs., Pulv. Ipecac. $\frac{1}{2}$ gr., Pulv. Zingib. $2\frac{1}{2}$ grs. and Sod. Bicarb. $2\frac{1}{2}$ grs., M., T.d. In a recently enlarged spleen, with or without ague, the writer uses this formula with marked success. Fluoride of quinine may sometimes reduce chronic hypertrophy of the spleen.

(3) *Malarial remittent and malarial continued fevers* usually run a definite course, but their intensity and progress may be controlled by the judicious use of quinine. The writer always administers either the saheylate or the hydrobromide in 3 to 5 gr. doses twice or thrice daily during remission in remittent, and without any reference to temperature in continued fevers. But as soon as the intermission is obtained, he gives quinine with bark and stimulants. In these fevers it is a mistake to give quinine in antipyretic doses, for it only depresses the heart without affecting materially the temperature.

(4) *Malignant forms of ague or pernicious malarial fever*.—Many deaths occur from this type of fever, either from ignorance or from want of courage on the part of the physician to administer quinine in sufficiently large doses. From the beginning without any reference to temperature or local symptoms, with stimulants if necessary,

quinine must be given in 20, 30, or 40 gr. doses either by the mouth or by the rectum. Hypodermic or intravenous injection sometimes succeeds well.

(5) *Kala Azar*, which was formerly supposed to be a pernicious type of malarial fever, is now known to be due to the Leishman-Donovan body, a parasite which Rogers has shown to be a phase in the life-history of a trypanosome. Rogers ("Fevers in the Tropics") advocates the administration daily of 60 to 90 grs. of Quinine continued for many weeks in *Kala Azar*, and reports favourable results in this extremely fatal disease.

In the so-called *Malarial Cachexias*, especially those of the *hæmorrhagic type*, quinine is worse than useless: it is an actual poison. This is what we would expect when one remembers that it is both a leucocyte poison and a hæmolytic. In all these cachexias there is a marked leucopenia, and therefore quinine must be harmful. Koch indeed goes so far as to say that "Blackwater fever," i.e. fever with hæmoglobinuria, is merely quinine poisoning, and the editor's experience entirely bears out the truth of this view.

(6) *Intermittent or remittent neuralgias*, such as **brow-ague, face-ache or headache** of malarial or non-malarial origin, often yield to quinine.

As a *prophylactic* against **ague** and other **malarial affections** it has been found very effective, but we cannot define the period during which we should continue it, for relapses have taken place after one, two or more years; even when the patient has been removed from an infected place and has had no chance of a fresh infection. By cinchonising its inhabitants we can markedly lessen the malarial fever of a district, as is being done in the Campagna by the Italian Government, and at the Isthmus of Panama by the American Government with remarkable results.

As an *ecbolic* it is always prescribed in place of ergot during **labour**, if there is no obstruction. Ten grains followed by a similar dose after one or two hours often strengthen weak pains.

As a *nervine tonic* it has been used with great benefit in a host of nervous diseases, generally in combination with iron and strychnine, as Easton's Syrup.

Besides the diseases already mentioned, quinine may be given in **acute catarrh, influenza, hay fever, croup, diphtheria, pneumonia, passive hæmorrhage, lumbago, sciatica, septicæmia and catheter-fever.**

Caution.—It should be avoided or given very cautiously in acute or subacute diseases of the middle ear, gastro-enteritis, extreme anæmia, active cerebral congestion, skin eruptions, such as erythema, urticaria, &c., and to persons particularly susceptible to its influence.

Prescribing hints.—It should always be given in solution and never in the form of pills or tablets. Mineral acids (1 m. to each grain) and tincture of ferric chloride dissolve the sulphate, but unless an

excess of acid is used, it will leave a persistently bitter after-taste. To avoid this it may as well be given in an effervescing form dissolved in citric acid, or simply suspended in water. To diminish cinchonism the sulphate may be dissolved by the aid of dilute hydrobromic acid in the proportion of 2 m. of the acid for each grain of quinine. Too large doses of hydrobromic acid, however, are apt to cause diarrhoea. The after-taste of quinine is soon removed or not perceived at all if the patient swallows a little water after taking the drug, and chews a few bits of betel-nut, myrobalan (*haritaki*), unripe guava, or any other substances containing tannin. Being almost tasteless, quinine is suitable for administration to children (*see* p. 117).

If there is much *gastric irritability*, any of the soluble neutral or acid salts may be given hypodermically, or in their absence the sulphate may be used as an enema or may be given with opium. The intravenous injection should be resorted to only in cases of extreme urgency. The antiperiodic virtue of quinine is greatly enhanced if we combine with it the preparations of cinchona (*see* p. 110), opium, Indian hemp, arsenic, &c. In many obstinate malarious fevers, Warburg's tincture may be employed with great benefit, but it should be used with caution, as it causes copious perspiration, fall of temperature and weakness and slowing of the heart.

The strictest asepsis must be maintained when giving hypodermic injections of quinine. Several regrettable cases are on record where tetanus has resulted from want of proper care in this respect.

CINNAMOMI CORTEX

Cinnamon Bark. N.O. *Laurineæ*

Syn. I. V.—*Dálchini*, Beng. and Hind. *Gudatvak*, Sans.

Habitat.—Ceylon. Known as "Ceylon Cinnamon" in commerce.

Source.—The dried inner bark of shoots from the truncated stocks of *Cinnamomum zeylanicum*. Obtained from cultivated trees.

Characters.—In rolled quills; thin, brittle, splintery, light yellowish-brown; $\frac{3}{8}$ in. in diameter. Odour fragrant. Taste warm, sweet, aromatic.

Impurity.—Cassia bark.

Identification.—It resembles cassia bark, which is coarser, thicker, and less aromatic.

Composition.—(1) *Volatile Oil* (*off.*). (2) *Tannin*. (3) *Sugar*. (4) *Gum*.

Action.—Aromatic, stimulant, astringent. **Dose.**—10 to 30 grs.

Enters into.—Decoc. *Hæmatoxyl.*, Pulv. *Catechu Co.*, Pulv. *Cretæ Atom.*, Pulv. *Kino Co.*, Tr. *Card. Co.*, Tr. *Catechu Co.*, Tr. *Lavand. Co.*, and the

OFFICIAL PREPARATIONS

1. **Aqua Cinnamomi.**—1 in 10. **Enters into.**—Chalk, Guaiacum, Castor Oil, and Brandy Mixtures, and Aromatic and Aromatic Cascara Syrups. **Dose.**—1 to 2 ozs.

2. **Pulvis Cinnamomi Compositus.** **Syn. B.P.**—*Pulv. Aromat.*—1 in 3. **B.P. Dose.**—10 to 40 grs. **Enters into.**—Pil. *Aloes et Ferri* and Pil. *Cambog. Co.*

3. **Tinctura Cinnamomi.**—1 in 5. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.

OLEUM CINNAMOMI. Oil of Cinnamon

Source.—The oil distilled from cinnamon bark.

Characters.—Yellowish when fresh, becoming reddish gradually. *Sinks in water.* *Solubility.*—1 in 10 of alcohol. *Impurities.*—Cinnamon leaf-oil and cassia-oil.

Composition.—(1) *Cinnamic Aldehyde.* (2) *A Terpene.* (3) *Eugenol.*

Action.—Aromatic stimulant, antiseptic. **B.P. Dose.**— $\frac{1}{2}$ to 3 *ms.*

OFFICIAL PREPARATION

1. **Spiritus Cinnamomi.**—1 in 10. **B.P. Dose.**—5 to 20 *ms.* *Enter into.*—Acid. Sulph. Aromat.

PHARMACOLOGY AND THERAPEUTICS

Internally.—The actions and uses of cinnamon bark and its oil resemble those of cloves and the oil of cloves (*q.v.*), but the bark has besides a mild **astringent** property. As a flavouring and correcting agent both the bark and the oil are used. In **acute dysentery** the bark has been found useful in 60 to 90 gr. doses twice daily. Dr. Drummond has obtained good results from the decoction. The writer has found the bark useful in **mucous diarrhoea.**

CISSAMPELOS

Cissampelos. N.O. *Menispermaceæ*

(*Ind. and Col. Addendum*)

Syn.—False Pareira Brava. **Syn. L. V.**—*Nimuka*, Beng. *Akúdu Nirbasi*, Hind.

Habitat.—India and Eastern Colonies.

Source.—The dried root of *Cissampelos pareira*.

Characters.—In compressed, undulating pieces, $\frac{1}{2}$ in. in diameter, covered with dark brown bark, with longitudinal furrows and transverse cracks. No odour. Taste bitter.

Composition.—The same as that of the true Pareira (*q.v.*).

Action.—Tonic, diuretic.

OFFICIAL PREPARATIONS

1. **Decoctum Cissampeli.**—Root 2 $\frac{1}{2}$ ozs., water *q.s.* Boil for 15 minutes to 1 pint. **B.P. Dose.**— $\frac{1}{2}$ to 2 ozs.

2. **Extractum Cissampeli Liquidum.**—1 in 1. **B.P. Dose.**— $\frac{1}{2}$ to 2 drs.

PHARMACOLOGY AND THERAPEUTICS *

Its actions and uses are identical with those of the true Pareira root (which see).

COCÆ FOLIA

Coca Leaves. N.O. *Lineæ*

Syn.—Coca.

Habitat.—Peru, Bolivia.

Source.—The dried leaves of *Erythroxylum coca* and its varieties.

Characters.—The leaves from *Bolivia* $1\frac{1}{2}$ to 3 in. long, 1 to $1\frac{1}{2}$ in. broad, brownish-green, oval, entire, glabrous; upper surface bears a ridge above midrib; on the under surface near to the midrib on either side is a curved line. The midrib is prolonged to a horny apiculus. Odour characteristic. Taste bitter followed by a sensation of numbness. Should be free from mildew. The *Peru* leaves are somewhat smaller, narrower, and do not exhibit a prominent ridge or curved lines.

Identification.—The general appearance, the size, the ridge, and the curved lines distinguish it from *Senna*, *Jaborandi*, and *Digitalis* leaves.

Composition.—Three alkaloids.—(1) *Cocaine* (off.) 0.2 p.c. (2) *Truxilline*, formerly called *Cocamine*, and (3) *Cinnamyl-cocaine*. (4) *Tropa-cocaine*. (5) *Coca-wax*. The strength varies. Fresh specimens are the strongest.

Incompatibles.—Mineral acids which decompose cocaine into benzoic acid, and ecgonine, mercurial salts, silver nitrate, menthol, and sodium bromide.

Action.—Stimulant, tonic, restorative. *Dose.*— $\frac{1}{2}$ to 2 drs.

OFFICIAL PREPARATION

1. **Extractum Cocæ Liquidum.** *Syn.*—*Ext. Erythroxyli fluidum, U.S.*—1 in 1. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.

NON-OFFICIAL PREPARATIONS

1. **Elixir Cocæ.**—1 in 6 of simple elixir. Very palatable. *Dose.*—1 to $\frac{1}{4}$ drs.

2. **Infusum Cocæ.**—1 in 50 of boiling water. A refreshing beverage.

3. **Vinum Cocæ.**—1 in 8 of sherry. Checks vomiting. *Dose.*— $\frac{1}{2}$ to $\frac{1}{2}$ oz.

PHARMACOLOGY

Internally.—The leaves have the taste and flavour of green tea. They are a **respiratory** and **cerebral stimulant**, and a **nervine** and **muscular tonic**. They seem to appease hunger and thirst and relieve fatigue, and in large doses cause insomnia.

THERAPEUTICS

Internally.—The natives of the country where the plant grows, chew its leaves in the day so that they may defer their eating till the evening. The leaves have been found useful in **dyspepsia**, **gastralgia**, **gastrodynia**, **vomiting** or **discomfort** caused by **heavy eating** or **drinking**. The liquid extract is useful for checking the craving for morphia or alcohol.

COCAINA

Cocaine. $C_{17}H_{21}NO_4$

Source.—An alkaloid obtained from Coca leaves.

Characters.—Colourless, monoclinic prisms with a bitter taste, followed by tingling and numbness. **Solubility.**—Insoluble in water and glycerin, 1 in 10 of alcohol (90 p.c.), 1 in 4 of ether, 2 in 1 of chloroform, 1 in 4 of oleic acid, 1 in 12 of olive oil. **Impurities.**—Sulphates, chlorides. *Dose.*— $\frac{1}{16}$ to $\frac{1}{2}$ gr. in pill.

OFFICIAL PREPARATION

1. **Unguentum Cocainæ.**—1 in 25.

COCAINÆ HYDROCHLORIDUMCocaine Hydrochloride. $C_{14}H_{21}NO_7HCl$ **Syn. B.P.**—Hydrochlorate of Cocaine.**Source.**—The hydrochloride of an alkaloid obtained from coca leaves.**Characters.**—In colourless, acicular crystals or crystalline powder. Taste bitter. **Solubility.**—2 in 1 of water, 1 in 4 of alcohol (90 p.c.), 1 in 4 of glycerin. **Impurities.**—Other alkaloids of coca leaves.**Tests for Purity.**—(1) Dissolve 1 gr. of the salt in water 2 ozs., add 3 drops of solution of ammonia B.P. when a crystalline precipitate (amorphous alkaloid) will fall down on stirring. (2) Add $\frac{1}{2}$ c.c. of $\frac{1}{10}$ p.c. solution of potassium permanganate to $\frac{1}{10}$ gramme of cocaine salt dissolved in 5 c.c. of water acidified with H_2SO_4 . The colour should not disappear within an hour.**Action.**—Locally anæsthetic, mydriatic. **B.P. Dose.**— $\frac{1}{8}$ to $\frac{1}{2}$ gr.**OFFICIAL PREPARATIONS**

1. **Injectio Cocainæ Hypodermica.**—10 grs. in 110 ms. **B.P. Dose.**—2 to 5 ms.
2. **Lamelles Cocainæ.**— $\frac{1}{10}$ gr. in each.
3. **Trochiscus Kramariæ et Cocainæ.**— $\frac{1}{20}$ gr. in each. A local astringent and anæsthetic. **Dose.**—3 to 6.

NON-OFFICIAL PREPARATIONS AND DERIVATIVES OF COCAINE

1. **Cocaine Bougies, Pessaries, and Suppositories.**— $\frac{1}{2}$ gr. in each.
2. **Ceratum Cocainæ.**—1 to 30 with petroleum cerate. In *burns, scalds, pruritus, urticaria*.
3. **Collodium Cocainæ.**—2 p.c. in collodium flexile. In *inflamed chilblains*.
4. **Empl. Cocainæ.**—1 in 50 of lead-plaster. In *neuralgia, tender corns, and bruises*.
5. **Nebula Cocainæ Oleosa.**—2 p.c. in almond oil. In *earache*.
6. **Pastillus Cocainæ Hyd.**— $\frac{1}{10}$ gr. in each.
7. **Oleatum Cocainæ. U.S.**—Cocaine 5, alcohol 5, oleic acid 50, olive oil *q.s.* to 100. It has an objectionable odour.
8. **Cocainæ Formas.**—Combination of Cocaine and Formic Acid. **Dose.**— $\frac{1}{10}$ to $\frac{1}{2}$ gr.
9. **Cocainæ Citras.**—Deliquescent crystals. Used by dentists. **Dose.**— $\frac{1}{10}$ to $\frac{1}{2}$ gr.
10. **Cocainæ Hydrobromidum.**—Stable, acicular, white. **Dose.**— $\frac{1}{10}$ to $\frac{1}{2}$ gr.
11. **Cocainæ Nitras.**—Colourless, soluble in water. Is compatible with silver nitrate, and lessens pain of silver application. **Dose.**— $\frac{1}{10}$ to $\frac{1}{2}$ gr.
12. **Cocainæ Salicylas.**—Deliquescent, granular, white. **Dose.**— $\frac{1}{20}$ to $\frac{1}{2}$ gr.
13. **Cocainæ Sulphas.**—Deliquescent, granular, white. **Dose.**— $\frac{1}{10}$ to $\frac{1}{2}$ gr.
14. **Eucaine Hydrochloride.**—The hydrochloride of Benzoyl-vinyl-diaceton-alkamine. In small white opaque crystals, soluble about 1 in 30 of water. Eucaine is slower in its action than cocaine, but it is more reliable and three times less toxic. Solutions of double the strength of

cocaine are necessary but anæsthesia is more prolonged, and there is no weakening of the heart or dilatation of pupils. *Dose.*— $\frac{1}{10}$ to $\frac{1}{2}$ gr.

15. **Holocaine Hydrochloride.**—A synthetic compound in colourless shining crystals, soluble 1 in 55 of water. Anæsthetic, but toxic.

16. **Orthoform "New."** *Syn.*—*Methyl ester of Meta-amido-para-ortho-benzoic acid.*—In white crystals. Locally anæsthetic and antiseptic. Its **hydrochloride** is soluble 1 in 9 of water, but is acid and irritating. Recommended as a local anæsthetic in operations within uterus. *Dose.*— $1\frac{1}{2}$ to 3 grs.

17. **Nirvanin.** *Syn.*—*Hydrochloride of diethyl-glycoll-para-amido-ortho-hydrobenzoic-methyl ester.*—In white prisms soluble in water. A local anæsthetic and antiseptic. Effects are more prolonged.

18. **Tropacocaine.** *Syn.*—*Benzoyl-pseudo-tropine.*—Obtained from Java coca. Is alleged to be safer, more rapid, and less irritating to the eye without dilating its pupil. Its **Hydrochloride** is freely soluble in water. Very costly.

19. **Cocainæ Hydriodidum.**—Hard, colourless crystals, slightly soluble in water. Used in dentistry. *Dose.*— $\frac{1}{10}$ to $\frac{1}{2}$ gr.

20. **Cocainæ Periodidum.**—Violet-black crystals. Has been tried for the vomiting of pregnancy. *Dose.*— $\frac{1}{10}$ to $\frac{1}{2}$ gr.

21. **Cocainæ Phenas.**—A pasty compound used by dentists and has been given for gastralgia. *Dose.*— $\frac{1}{10}$ to $\frac{1}{2}$ gr. (in pill).

22. **Acoine.** *Syn.*—*Di-para-anisyl-mono-phenethyl-guanidine hydrochloride.*—A white crystalline powder. A 2 p.c. solution in normal saline used in dentistry.

23. **Anæsthesine.**—*Syn.*—*Ethyl ester of Para-amido-benzoic Acid.*—In dyspepsia. *Dose.*—5 to 10 grs. (in cachets).

24. **Alypin.** *Syn.*—*Benzoyl-tetramethyl diaminoethyl-dimethyl-carbinol-monochlorhydrate.*—A white crystalline powder, readily soluble in water, giving solutions of a neutral reaction, which yield no precipitate with sodium carbonate solution. A local anæsthetic, used hypodermically for minor operations and in ophthalmic practice. The anæsthesia lasts from 8 to 10 minutes. It is equal in intensity to Cocaine and much less toxic. Moreover it does not cause irritation of the conjunctiva. May be used in strengths of from 1 to 4 p.c.

25. **Stovaine.** *Syn.*—*Ethyl-dimethyl-amino-prominol hydrochloride.*—A local anæsthetic less toxic than cocaine. It is said to be inferior to cocaine as an instillation; on the other hand, as a subconjunctival injection, it surpasses cocaine in its effects, and is specially useful in operations for strabismus. It does not alter the tension of the eyeball. A 4 p.c. solution in normal saline is the strength used for ophthalmic work.

PHARMACOLOGY

Externally.—Cocaine hydrochloride is the strongest and the most soluble of all preparations. It has no action on the unbroken skin. Applied to the mucous membrane it causes **blanching**, probably from the constriction of the local blood-vessels, and **anæsthesia** from the paralysis of the periphery of the sensory nerves. Injected subcutaneously it deadens the sensibility and reddens that part around the puncture. These effects may be produced by a 5 to 10 p.c. solution, but they do not last long.

Internally. **Mouth.**—Locally applied it abolishes the sensibility and taste of the tongue, and the sensibility of the palate and fauces. It diminishes the salivary secretion. A 50 p.c. solution annuls the sensibility of the gums.

Stomach and intestine.—In very minute doses it acts as a **stomachic tonic**, and in moderate doses diminishes the flow of the gastric juice, and deadens the sensation of hunger and of pain, if present. In large doses it checks peristaltic action, causing either diarrhoea or costiveness.

Heart and circulation.—In moderate doses it increases the frequency of the pulse and raises the blood-pressure, and in large doses it diminishes both. The first effect is due to depression, and the second to stimulation of the vagus.

Respiratory tract.—Topically applied it deadens the sensibility of the nasal mucous membrane. Given internally it first increases the respiratory movements from the stimulation of the respiratory centre, but soon depresses them. Death results from **asphyxia**.

Nervous system. *Cerebrum.*—It acts like caffeine on the nerve centres but more powerfully, producing a feeling of comfort and ease with the abolition of mental and bodily fatigue. Often it causes **sleeplessness** though without much discomfort. In large doses it depresses the nerve-centres, affecting first the cerebrum, then the bulb, and lastly the cord. By directly applying the drug to the psycho-motor centres, Tumas lowered their excitability, and by painting it over the cerebral cortex, prevented convulsions.

Spinal Cord.—Large doses not only paralyse the terminations of the sensory nerves, but affect also the conducting power of the cord, both sensory and motor, but more powerfully that of the sensory tracts. By directly applying cocaine to the sciatic nerve of a frog. Dr. Koch prevented the transmission of the sensory stimuli, and after repeated applications that of the motor stimuli also. The muscular work is increased but we do not know how this is effected.

Eye.—A 4 p.c. solution dropped into the eye causes complete **anæsthesia of the conjunctiva and cornea**, and partial anæsthesia of the iris. It **dilates the pupil** as widely as atropine (*see* p. 161), slightly **lowers ocular tension** and partially **impairs the range of accommodation**, the latter effects being only transitory. These effects are caused by stimulation of the **sympathetic**, and as they are more quickly produced when the drug is applied topically than when taken by the mouth, they appear to be due to direct local action.

Metabolism is not much altered. The **temperature** rises in cocaine poisoning.

Kidneys and sexual organs.—It is eliminated in the urine, the quantity of which is said to be increased. **Sexual excitability** is diminished.

Acute toxic action.—Acute poisoning is not infrequent. Toxic symptoms have been produced from a hypodermic injection of $\frac{1}{2}$ gr. Waking hallucinations like those in poisoning by Indian hemp, leading sometimes to mania, vertigo, respiratory and cardiac difficulty, cramps in the limbs, inability to move, and a sensation of foreign bodies, such as pebbles or worms, especially the latter, moving under the skin, are characteristic.

Antidotes.—Emetics, or pump, if necessary. Amyl nitrite, nitroglycerin, ammonia, strong coffee by the mouth or rectum, strychnine and ether hypodermically.

Chronic toxic action or "Cocainism."—Like coca-craving, cocainomania is developed either in shaking off the morphine or alcohol habit or from the temporary use of cocaine as a stimulant. Disordered digestion, emaciation, giddiness, quick pulse, insomnia, visual or other hallucinations, amnesia, and impotence are prominent symptoms. Habitués may consume up to 10 or sometimes 20 to 30 grs. Total abstinence from the drug, strong coffee, nux vomica, and other tonics, change of air, &c., remove this pernicious habit.

Cocainomania is rapidly increasing in Bengal. Cocaine is usually taken with *prepared pan*. The black colouring of the teeth observed by Dr. Buchanan is rather due to the constant chewing of the *pan* than to the use of the drug.

THERAPEUTICS

Externally.—Cocaine is chiefly used as a *local anæsthetic* in the following diseases :—

Eye.—A 4 p.c. solution or the official lamels dropped on the conjunctiva every 3 minutes 3 to 5 times, so far removes the sensibility as to enable the surgeon to perform many **operations**, as for example, **cataract**, &c., painlessly. Where **iridectomy** is necessary, a drop of the solution should be applied to the exposed iris immediately before making the section. **Photophobia**, conjunctival and corneal **pain** are soon relieved by the same collyrium. Combined with Liq. atrop. sulph., cocaine has been found very efficacious in **iritis** and in many painful inflammatory affections of the cornea. By adding $\frac{1}{2}$ gr. of pilocarpine nitrate to 1 dr. of a 4 p.c. solution, we may anæsthetize the eye without affecting the accommodation.

Nose, ear, anus, vagina, &c.—A 5 to 10 p.c. solution removes the sensibility of the mucous membrane of the nose, internal meatus of the ear, vagina, os uteri, urethra and rectum, so as to allow small operations to be performed painlessly. The nasal irritation in **hay fever**, **anal** and **labial pruritus**, **earache**, and the pain of **anal fissure** or **ulcer** are all relieved by the topical application of cocaine.

Skin.—Although cocaine is known not to be absorbed by the intact skin, yet the application of the alkaloid combined with lard or oil allays the burning and pain of **eczema**, **erysipelas**, **urticaria**, **sore nipples**, &c. The pain and irritation of **burns** and **scalds** are soon relieved, if the **part** is first brushed over with a 4 p.c. aqueous solution

of cocaine hydrochloride and then the pure alkaloid combined either with carron oil or with paraffin or boric acid ointment is applied. A hypodermic injection of cocaine acts like a charm in removing the pain of **scorpion-stings**. **Buboes, small tumours, inflamed bursæ, small abscesses** may be painlessly dealt with after injections of cocaine in their neighbourhood. Many superficial **neuralgias** may be quickly relieved by the local application of the alkaloid in oil of cloves, and **sciatica** by the injection of an aqueous solution into the sheath of the nerve.

Intraspinal and local infiltration anæsthesia.—*Intraspinal anæsthesia* by means of cocaine solutions, introduced by lumbar puncture, was at one time advocated for the performance of certain minor operations. On account of certain mishaps it fell temporarily into disrepute, but its use has lately been revived especially by Prof. Thomas Jonnesco who has reported a remarkable series of cases of its successful use. The anæsthetic he uses is stovaine, but tropacocaine or novocaine may be used in the same way. To these solutions he adds strychnine, which renders the anæsthetic solution more tolerable to the higher nerve-centres. He and his assistants have employed spinal anæsthesia by the stovaine and strychnine method in 625 cases without a death, or any serious complication during or after operation. He injects in two situations (1) "upper dorsal" between first and second dorsal vertebra and (2) "dorso-lumbar" between 12th dorsal and 1st lumbar vertebra.

Anæsthesia by the local infiltration method consists in subcutaneous injection of either cocaine or eucaïne along the proposed lines of incision and then into the deeper parts before cutting them. The anæsthesia may be prolonged by applying an Esmarch's bandage when possible above the line of incision. This also checks the tendency to the production of toxic symptoms by absorption. Recently adrenalin chloride has been added to the solution with the view of checking hæmorrhage, but it has been found to increase the risk of local sloughing. Nowadays cocaine is rarely used for this purpose, as eucaïne gives so much more satisfactory results. The solution used is B. Eucaïne 3 grs., Sodium Chloride 12 grs., Distilled water 3¼ ozs. It must be sterilized by boiling immediately before use, and either half or the whole of the solution may be used according to the severity of the operation.

Internally. Gums and teeth.—Cocaine, preferably the alkaloid as it is less likely to be washed away by the saliva, is largely employed in dentistry to deaden the sensibility of the exposed pulp. Cocaine hydrochloride 1, chloral hyd. 5, and camphor 5, form an oily liquid when warmed, which wonderfully removes **toothache**. A tooth may be painlessly extracted by injecting a solution into the gums at its base, but this is a risky proceeding. The mere rubbing of cocaine over the gums deadens their sensibility to such an extent as to annul the pain of the first application of the forceps.

Throat and larynx.—By applying a 20 p.c. solution to the soft palate and pharynx, **enlarged tonsils** or **small growths** in those parts may be excised, or the galvano-cautery applied painlessly. By the same method the larynx may be explored and minor operations performed there without spasm or pain. In painful **sore throat** cocaine and rhatany lozenges are an excellent local application.

Stomach.—For its local effects on the gastric mucous membrane, it may sometimes be used in **sea-sickness** and **vomiting of pregnancy**. 1 gr. with 10 or 15 ms. of tincture of belladonna is often sufficient for this purpose.

As a restorative or respiratory stimulant it is rarely used. In **pertussis** of infants it is given in $\frac{1}{16}$ gr. doses three times a day.

Prescribing hints.—An aqueous solution of cocaine requires a preservative such as salicylic acid to prevent the growth of fungi, which have been found in old solutions, and to which have been attributed many untoward effects, such as sudden fainting, &c. Not more than $\frac{3}{4}$ gr. cocaine should be injected hypodermically at once. Precautions should be taken to prevent its indiscriminate use and the formation of a cocaine habit. A solution of cocaine should not be used as a spray for fear of poisoning from absorption by the lungs, and it should never be injected into either the gums or the cervix uteri.

COCCUS. Cochineal

N.O. Hemiptera

Syn. I. V.—*Crimidáná*, *Cringdáná*, Beng., Hind.

Habitat.—Mexico, Teneriffe, Rajputana, Southern India.

Source.—The dried tecundated female insect *Coccus cacti*, reared on *Nopalea coccinellifera* (N.O. *Cactææ*) and other species of *Nopalea*.

Characters.—Oval, flat, or concave beneath, convex above, transversely wrinkled, purplish-black or purplish-grey, easily powdered. Powder dark red or puce-coloured.

The insect is ash-grey with a silvery surface when dried in the sun, reddish when killed by immersion in boiling water, and black when dried by artificial heat.

Composition.—(1) *Carminic Acid*, a glucoside. *Carmine* is precipitated from the decoction by sulphuric acid and other reagents.

Enters into.—Tr. Card. Co., Tr. Cinchon. Co., and the

OFFICIAL PREPARATION

1. **Tinctura Cocci.**—1 in 2. **B.P. Dose.**—5 to 15 ms.

USES

Cochineal is used as a colouring agent. Alkalis turn carmine purple.

CODEINA. See **Opium**

COLCHICI CORMUSColchicum Corm. N.O. *Liliaceæ***Habitat.**—British Isles.**Source.**—The fresh corm of *Colchicum autumnale*, collected in early summer; and the same stripped of its coats, sliced transversely and dried at a temperature not exceeding 150° F.**Characters.**—*Fresh corm.*—1½ in. long, 1 in. broad, conical, hollowed on one side where it has a new corm in process of development, rounded on the other; outer coat thin, brown, membranous; inner coat reddish-yellow. Internally white, solid, yielding bitter disagreeable milky juice. *Dried slices.*—1½ to 1 in. thick, yellowish at circumference, reniform, firm, whitish, amylaceous. Taste bitter. No odour.**Identification.**—The *reniform* appearance is characteristic, though not well marked in some specimens. Squill and tragacanth are not reniform and have special characters (*q.v.*).**Composition.**—(1) *Colchicine*, 0.5 p.c., an active alkaloid. (2) *Veratrine*, a trace with gallic acid. (3) A *Fixed Oil*. (4) *Gum, Sugar, Starch, &c.***Incompatibles.**—Astringent preparations, tincture of iodine, and guaiacum.**Action.**—Diuretic, purgative. **B.P. Dose.**—2 to 5 grs.

OFFICIAL PREPARATIONS

1. **Extractum Colchici.**—10 yield 4. **B.P. Dose.**—¼ to 1 gr.
2. **Vinum Colchici.**—1 in 5. **B.P. Dose.**—10 to 30 ms.

COLCHICI SEMINA

Colchicum Seeds

Source.—The dried ripe seeds of *Colchicum autumnale*.**Characters.**—1½ in. in diameter, subglobular, slightly pointed, rough, reddish-brown, hard, tough, minutely bitter. Endosperm oily. Taste acid, bitter. No odour.**Identification.**—Resemble black mustard seeds, which are smooth and smaller.**Composition.**—(1) *Colchicine*, 0.6 to 1.0 p.c. (2) An additional *Volatile Oil*, besides the other ingredients as in the corm.

OFFICIAL PREPARATION

1. **Tinctura Colchici Seminum.**—1 in 5. **B.P. Dose.**—5 to 15 ms.

NON-OFFICIAL PREPARATIONS

1. **Colchicine.**—A yellowish powder. *Dose.*—½ to 1½ gr.
2. **Colchicine Salicylate.** *Syn.*—*Colchi-sal.*—A yellowish powder soluble in water. *Dose.*—10 gr.

PHARMACOLOGY

Externally.—Locally applied to the skin and mucous membrane colchicum acts as an irritant, producing redness and smarting. Inhaled, its powder causes sneezing and watering of the eyes.

Internally. **Gastro-intestinal tract.**—It acts as an irritant to the mouth and fauces and increases salivation. Given either by the mouth or hypodermically (for the active principle is eliminated into the intestine) in small doses, it increases the gastric and the intestinal secretion, but this effect is not observed in every case. In moderate doses it causes **purging, vomiting and abdominal pain.** In large doses it is a powerful **gastro-intestinal irritant.**

Liver.—In large doses it is a powerful direct **hepatic stimulant**, increasing the amount of bile secreted and the biliary constituents proper, though rendering the bile more watery.

Circulation and respiration.—It depresses the circulation, lowers the blood-pressure and slows the respiration. The pulse becomes feeble, soft and rapid. These effects are probably due not so much to the colchicine acting on the cardiac and respiratory organs, as to the consequences of severe gastro-enteritis.

Nervous system.—The brain is not affected even by toxic doses. In mammals the cord is chiefly affected. In poisoning the sensory nerves are powerfully depressed while the **spinal motor centres** are only weakened.

Kidneys.—Its action on the kidneys is uncertain. It may increase their action, especially as regards the excretion of urea, uric acid and other solids of the urine.

Acute toxic action.—The chief symptoms are those of gastro-intestinal irritation in a grave form. Violent burning in the throat, œsophagus and stomach; intense thirst; severe colic with vomiting and purging; the stools being first serous, then slimy and finally bloody; great prostration; rapid, feeble, and thready pulse; cold skin bedewed with sweat; slow and laboured respiration and lastly death during collapse from respiratory paralysis; consciousness not being lost.

Antidotes.—Emetics, followed by demulcent drinks, as white of egg freely diluted with water. Tannic acid is a chemical antidote. Stimulants, tea, and coffee; and morphine hypodermically.

Chronic toxic action.—Small medicinal doses long continued, bring about furred tongue, disagreeable taste, loss of appetite, thirst, epigastric pain, flatulence, and diarrhœa.

THERAPEUTICS

Internally.—Striking results follow administration of colchicum in **acute gout.** The severest pain and inflammation are removed in a few hours after a drachm or two of the wine of colchicum. It succeeds well in first attacks on robust patients, but cannot prevent a relapse even if it is continued during the interval between the attacks. How it acts in the disease is not known. Dr. Garrod has experimentally shown that colchicum can in no way influence the elimination of uric acid in gouty people. Besides its specific property in gout, colchicum has been found useful in many other complaints of gouty people, such as **dyspepsia, headache, hepatic congestion, neuralgia, bronchitis,**

urethritis, eczema, &c. It affords no relief in the chronic gout of old debilitated persons. **Rheumatic arthritis** may sometimes be relieved by colchicum and potassium iodide, but rheumatism is never benefited. For its direct cholagogue property, it may be advantageously combined with a purgative. A few grains of blue pill and compound colocynth pill make a valuable combination in the constipation of gouty persons.

Caution.—It should be avoided or given with great caution to the weak, the infirm and those who suffer from cardiac weakness, chronic diarrhoea, chronic dysentery or colic.

Prescribing hints.—Colchicum may be administered in *acute gout* in two ways—either in full doses, say 1 dr. of the wine, repeated every 2, 3, or 4 hours, or in repeatedly small doses, say 20 ms. of the wine, every 3, 4 or 6 hours while the pain lasts. It should never be combined with acids as they *intensify* its irritating property while alkalis given with it mitigate the same. Magnesia makes a valuable corrective, as in the following formula:—Vin. Colchici 4 drs., Mag. Sulph. 1 oz., Mag. Carb. 2 drs., Aq. Menth. Pip. ad 12 ozs. M. $\frac{1}{2}$ part every fourth hour. Ordinarily the wine is used, but it deserves to be noted that the wine of the seeds is stronger than that of the corm. As it is a cardiac depressant the bowels must always be kept open during a course of colchicum to prevent accumulation of the drug in the system.

COLLODIUM. Collodion

Source.—Prepared by mixing pyroxylin 1, ether 36, and alcohol (90 p.c.) 12, and setting aside for a few days and decanting the clear solution.

Characters.—A colourless, inflammable, syrupy liquid with ethereal odour. Leaves a thin, transparent film which contracts on drying.

OFFICIAL PREPARATIONS

1. **Collodium Flexile.**—1 in 48. Does not contract on drying.
2. **Collodium Vesicans.**—See p. 313.

NON-OFFICIAL PREPARATIONS

1. **Anodyne Colloid.** *Syn.*—*Amyl Colloid.*—Amyl Hydride $\frac{1}{2}$ oz., Aconitine 1 gr., Veratrine 6 grs., Collodion to 2 ozs. Relieves pain instantly in *neuralgia, sciatica, lumbago, &c.*

2. **Collodium Stypticum B.P.C.** *Syn.*—*Styptic Colloid.*—Benzoin 44 grs., Absolute Alcohol 1 oz. Dissolve and filter, and add Tannic Acid 1 oz., Ether (sp. gr. 0.72) 4 ozs., and Pyroxylin 44 grs. Mix, set aside for three days, and decant. A powerful *local hæmostatic* when applied to a bleeding surface.

3. **Colloidin.**—Pyroxylin purified by solution in alcohol and ether. For embedding microscopic specimens and for surgical use. For the latter purpose it is dissolved in equal parts of methylated ether and alcohol in the proportion of 1 to 7.

4. **Photoxylin.**—A similar preparation.

5. **Colloidum Belladonnæ.** *Syn.*—*Emp. Belladonnæ Fluidum. B.P.C.*—See p. 266.

PHARMACOLOGY AND THERAPEUTICS

Externally.—Painted over the skin, collodion leaves a thin film from the evaporation of ether. This coating is impervious to air and moisture, but contracts and cracks as it dries (not the flexible collodion), and thereby causes a **partial anæmia** of the part by pressure on the local blood-vessels. As an *antiseptic protective covering*, it may be usefully applied to **small, inflamed, broken or cut surfaces, chapped nipples or threatening bed-sores**. It is particularly suited to **scalp wounds**, as by its contractile property it not only helps to draw the edges together, but does away with the necessity of a bandage. It may be employed to arrest local **hæmorrhage** from small cuts or wounds, as in leech-bites, and to close **punctured openings** as in paracentesis. For its **pressure-effect on the local circulation**, it has been found useful in small **nævi** and **port-wine marks**. It reduces inflammatory swelling when painted over **boils** in their early stages, and on **erysipelatous surfaces**. If painted over the face in **small-pox** it lessens pitting, and when applied to the mouth of the urethra or orifice of the prepuce it prevents nocturnal **incontinence of urine** in children. Mixed with salicylic acid (*see p. 200*), it dissolves **corns** and **warts**, and with salicylic acid and zinc chloride or lactic acid, small **lupoid** and **epithelial growths**. With iodoform it forms a very effective pigment for **glandular swellings** and with iodine for **ringworm, alopecia** and **inflamed, gouty or rheumatic joints**.

Caution.—No flame should be brought near the part until the evaporation is complete.

COLOCYNTHIDIS PULPA

Colocynth Pulp. N.O. *Cucurbitaceæ*

Syn.—Bitter Apple. **Syn. I. V.**—*Múkhál phal*, *Indráyan*, Beng., Hind. *Indrabáruni*, Sans.

Habitat.—Imported from Smyrna, Trieste, France, and Spain.

Source.—The dried pulp of the fruit of *Citrullus colocynthis*, freed from seeds.

Characters.—The fruit in peeled, broken balls about 2 in. in diameter. The pulp (broken up) is light, spongy, whitish, colourless, intensely bitter. **Impurities.**—Seeds, cortex, and starch.

Identification.—The apple when entire is easily identified. The fragments are recognised by their spongy, porous, and tearable characters. The seeds are egg-shaped, small, greenish-yellow.

Composition.—(1) *Colocynthin*, a bitter glucoside. (2) *Resinous Matter* known as citrullin, colocynthein, and colocynthitin. (3) *Mucilage* and *Gummy Matter*.

Action.—Drastic purgative.

OFFICIAL PREPARATIONS

1. **Extractum Colocynthis Compositum.**—1 in 4½ (nearly). Commonly prescribed with hyoscyamus to prevent griping. **B.P. Dose.**—2 to 8 grs.

2. *Pilula Colocynthis Composita*.—1 in 6. The water should only be added to this preparation at the time of dispensing. **B.P. Dose.**—4 to 8 grs.

3. *Pilula Colocynthis et Hyoscyami*.—2 and 1 in 3. Does not gripe. **B.P. Dose.**—4 to 8 grs. Its 5 gr. pills are known as **Hamilton's pills**, and 2½ gr. pills as **Christison's pills**.

PHARMACOLOGY

Internally.—In minute doses colocynth is a **bitter tonic**. In moderate doses it stimulates the **intestinal glands** and **muscular fibres** and the **liver**, causing watery evacuations and griping. Hence it is a **hydragogue drastic purgative**. These effects may be produced if the drug is given either by the mouth, or hypodermically, or injected into the circulation. In large doses these actions are aggravated and there is an intense **gastro-intestinal irritation**, reflexly affecting other abdominal organs. It may therefore cause abortion or cystitis.

THERAPEUTICS

Internally.—It is rarely prescribed for its tonic virtue, but is often given in combination with aloes and mercury in **constipation** due to hepatic disorder. It is an excellent purgative to relieve **portal engorgement**. It should always be given with hyoscyamus or belladonna to prevent griping. Hence pil. colocynth. et hyoscyami is a valuable preparation. Because of the watery character of the stools, it may sometimes be given in **ascites**, **dropsy** or **cerebral congestion**, but scammony, jalap and elaterium are more powerful in this respect.

Caution.—It should not be given either to pregnant women or to persons who are subject to diarrhoea, dysentery, piles or gastro-intestinal congestion.

CONII FOLIA

Conium Leaves. *N.O. Umbelliferae*

Syn.—Hemlock Leaves.

Habitat.—Britain.

Source.—The fresh leaves and young branches of *Conium maculatum* collected when the fruit begins to form (in June).

Characters.—*Leaves* divided pinnately, the lower decompound, about 2 ft. long, glabrous, arising from a smooth stem marked with purple spots. *Petioles* clasping; those of lower leaves hollow. Odour strong, disagreeable, like that of mice, especially when rubbed with a solution of potash.

Composition.—The same as that of the fruit.

Incompatibles.—Astringents, vegetable acids, caustic alkalis.

OFFICIAL PREPARATIONS

1. *Succus Conii*.—Brownish. **B.P. Dose.**—1 to 2 drs., but often given in much larger doses.

2. *Unguentum Conii*.—2 in 1. Yellow. Evaporate the juice to one-eighth. Becomes mouldy on keeping.

NON-OFFICIAL PREPARATION

1. **Vapor Coniæ.** B.P. 1885.—Hemlock juice 4, Liq. Potassæ 1, Distilled water 8. *Dose.*—20 drops upon the sponge of an inhaler. A useful sedative inhalation in *obstructive bronchial affections*.

CONII FRUCTUS. Conium Fruit

Source.—The dried full-grown unripe fruits of *Conium maculatum*.

Characters.—Ovoid, greenish-grey, 7 in. long, nearly as broad, laterally compressed and crowned by the depressed stylopod. In commerce, mericarps are separated; each glabrous with 5 irregular crenate ridges; endosperm deeply grooved. Odour perceptible when rubbed with solution of potash.

Identification.—Its peculiar shape and general appearance are characteristic. May be mistaken for caraway, anise, and dill fruits, but is distinguished by the absence of vittæ.

Composition.—(1) *Conine*, an oily, volatile liquid alkaloid with a mouse-like odour. This is the active principle. (2) *Methyl-conine*, a colourless fluid alkaloid. (3) *Conhydrine*, an inert alkaloid. (4) *Conic Acid*.

OFFICIAL PREPARATION

1. **Tinctura Conii.**—1 in 5. Brown. B.P. *Dose.*— $\frac{1}{2}$ to 1 dr.

NON-OFFICIAL PREPARATIONS

1. **Ext. Conii Liq.** B.P.C.—Exhausted with alcohol (60 p.c.), containing acetic acid 10 p.c. *Dose.*—5 to 15 ms.

2. **Conine.** *Syn.*—*Cicutine*, *Conicine*.—The active principle. The commercial conine contains also methyl-conine and conhydrine. *Dose.*— $\frac{1}{2}$ to 2 grs.

3. **Coniæ Hydrobromidum.**—In colourless prisms resembling mag. sulph., soluble in water. A powerful respiratory sedative. Recommended in *traumatic tetanus*, *spasmodic bronchitis*, *epilepsy*, *mania*, &c. *Dose.*— $\frac{1}{2}$ to 2 grs.

4. **Pil. Conii Comp.** B.P. 1885.—Ext. Conii 2½ ozs., Pulv. Ipecac. $\frac{1}{2}$ oz., Treacle q.s. *Mix.* *Dose.*—5 to 10 grs.

PHARMACOLOGY

Externally.—It has no action on the unbroken skin but paralyses the sensory and motor terminals, particularly the former, when applied to the mucous membrane or an abraded surface. It is therefore a **local sedative and antispasmodic**.

Internally. **Gastro-intestinal canal.**—Occasionally causes vomiting and purging.

Circulation.—Conine circulates unchanged. It increases the frequency of the pulse, probably from the depressed condition of vagal terminations. It does not seem to affect the cardiac and vasomotor centres.

Respiration is profoundly depressed, and death takes place from **asphyxia**, due to (1) the paralysis of the whole of the motor nerves, and (2) subsequent paralysis of the respiratory centre, and (3) the motor tract of the cord.

Nervous system. *Cerebrum*.—Hemlock has no action on the intellectual faculties. Consciousness remains unimpaired until asphyxia sets in.

Medulla and cord.—These remain unaffected until the drug is given in toxic doses, when the functions of the **motor cornua** and of the **respiratory centre** are feebly depressed. It is the methyl-conine which probably affects them.

Nerves.—It is a powerful **paralyser** of all the motor nerves, affecting first the end-plates, then gradually the whole trunk, and lastly the anterior cornua of the cord. As a result of these actions, all the **muscles** of the body which are concerned in voluntary and reflex movements are **paralysed**, but individually they retain their irritability to local stimuli. The sensory terminals are not affected except by the local application, but the conducting power of the sensory trunks seems to be impaired by toxic doses. The terminations of the vagus are paralysed.

Eye.—Conium dilates the pupil, impairs accommodation, and causes **ptosis**, probably because of the paralysis of the periphery of the **third nerve**. These effects follow whether conine is locally applied to the eye or swallowed.

Elimination.—It is eliminated in the urine unchanged.

Toxic action.—Hemlock is a powerful poison, yet some animals, such as goats, sheep, and horses take it without harm. In moderate doses it causes heaviness of the limbs, staggering gait, giddiness, confused vision, and thick speech; and in poisonous doses, complete paralysis of the muscles, fixed eyes, dilated pupils, dysphagia, loss of voice, shallow laboured breathing, and death from asphyxia.

Antidotes.—Emetics and pump. Tannic acid followed by "lavage." Artificial respiration. Stimulants, strychnine, and atropine hypodermically.

THERAPEUTICS

Conium is not much used nowadays on account of the variable strengths of its preparations, and the instability of its alkaloids.

Externally.—Hemlock ointment is a very useful preparation. It relieves the itching of **pruritus ani**, and the pain and spasm of **fissures** and **ulcerated hæmorrhoids**. The strength of the B.P. ointment requires sometimes to be increased, or belladonna or cocaine to be added to it. Cripps recommends the addition of 10 grs. of persulphate of iron to each ounce, if the ointment is intended for anal fissures.

Internally.—On account of its action upon the end-plates conium has been found useful in many **convulsive diseases**, such as chorea, infantile convulsions, paralysis agitans, laryngismus stridulus, &c.

Ringer gave 7 drs. of the juice hourly to a choreic child without harm. In **whooping-cough** and **mania** it has also been found serviceable. Its value in **tetanus** is doubtful. Pil. conii comp. B.P. 1885 is an excellent cough pill for lessening the sensibility of the respiratory centre in spasmodic forms of **chronic bronchitis**.

Caution.—The effects should be watched. As soon as any difficulty of swallowing or a feeling of weight in the legs is observed the administration of the drug is to be suspended.

Prescribing hints.—The juice and the tincture are the only reliable preparations. For a child one year old 10 to 20 or 30 ms. of the juice is not a large dose. Conine hydrobromide should be given in doses of $\frac{1}{2}$ gr. gradually increasing to 2 grs.

CONVALLARIA MAJALIS. (Non-official)

N.O. *Liliaceae*

Habitat.—The temperate zone.

Source.—The flowers, as well as the whole plant of *Convallaria majalis*, the Lily of the Valley.

Composition.—Two glucosides, (1) *Convallarin*, a drastic purgative. *Dose.*—3 to 4 grs. (2) *Convallamarin*, a cardiac tonic. *Dose.*— $\frac{1}{2}$ to 2 grs.

Action.—Resembles that of *Digitalis*.

NON-OFFICIAL PREPARATIONS

1. **Extractum Convallariæ.**—An aqueous extract. *Dose.*—2 to 8 grs.
2. **Ext. Convallariæ Fluidum. U.S.**—*Dose.*—2 to 10 ms.
3. **Tinctura Convallariæ. B.P.C.**—1 in 8 of proof spirit. *Dose.*—5 to 20 ms.

PHARMACOLOGY AND THERAPEUTICS

Convallaria has been used for ages by the Russian peasants for **dropsies**, and it is a valuable substitute for *digitalis* in cases where that drug is not well borne.

The extract is a fairly reliable preparation but the most uniform results are obtained from *convallamarin*, which is specially useful for preventing **cardiac failure** in chloroform narcosis.

Convallaria is not only useful in cases where there is actual valvular disease but it is of special value in **tachycardia** of nervous origin.

COPAIBA

Copaiba. N.O. *Leguminosæ*

Syn. B.P.—Copaiva, Balsam of Copaiba.

Habitat.—Valley of the Amazon. West and East Indies.

Source.—The oleo-resin obtained from the trunk of *Copaifera Lansdorfii* and other species of *Copaifera*.

Characters.—A light yellow or pale golden, thick, viscid liquid; generally transparent; sometimes opalescent or slightly fluorescent. Odour peculiar, aromatic. Taste acrid, somewhat bitter. **Solubility.**—Entirely in absolute

alcohol, ether, benzol, fixed and volatile oils. *Impurities*.—Turpentine, garjun balsam, and fixed oils.

Identification.—It is recognised by its characteristic smell and appearance.

Composition.—(1) The *Volatile Oil* (*off.*) 48 to 85 p.c. (2) The *Resin*, 15 to 52 p.c., which remains dissolved in the oil. The resin consists of (a) *Copaivic Acid*, a crystalline resin and (b) a non-crystallizable *Viscid Resin*.

Action.—Antiseptic, stimulant, diuretic. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.

OLEUM COPAIBÆ

Oil of Copaiba

Source and Characters.—A colourless or pale-yellow oil with the odour and taste of copaiba, distilled from copaiba; sp. gr. 0.900 to 0.910. *Solubility*.—1 in 1 of absolute alcohol. **B.P. Dose.**—5 to 20 *ms*.

OFFICIAL PREPARATIONS

1. **Copaiba Resin**.—Obtained by distilling off the volatile oil. Diuretic. *Dose.*—10 to 20 *grs*.

2. **Liquor Copaibæ B.P.** *Syn.*—*Soluble Copaiba*.—Copaiba 50, Solution of Potash 75, Water 25. Boil copaiba and solution of potash for 1 hour and mix with water thoroughly, set aside until cold. Decant the clear liquor from the upper oily portion and sediment, and evaporate to 95. To this add solution of potash *q.s.* to 100. *Dose.*— $\frac{1}{2}$ to 1 dr.

3. **Pasta Copaibæ**.—Copaiba 8, Cubebs 24, Extract of Hyoscyamus 1, Camphor 1, Treacle *q.s.* Make into a paste. *Dose.*—A piece of the size of a filbert nut three or four times a day.

PHARMACOLOGY

Externally.—Copaiba acts as a stimulant to the skin.

Internally. **Gastro-intestinal tract**.—It imparts an acrid nauseous taste, and a feeling of warmth to the epigastrium, and gives rise to disagreeable eructations. Continued long it causes dyspepsia and looseness of the bowels.

Mucous membrane.—The volatile oil and resin are readily absorbed into the blood, and are excreted by the mucous membranes, particularly by the mucous surface of the **genito-urinary and respiratory tracts**, which it stimulates, producing an increased vascularity, and increased secretion which, if foul, is **disinfected**. Thus copaiba is a **disinfectant and expectorant** and a **stimulating disinfectant** to the genito-urinary surface. It imparts the odour of the drug to the breath, urine and mucous secretions.

Skin.—It is excreted by the sweat glands, and acts as an irritant to the skin, producing sometimes an erythematous eruption, known as "copaiba rash." A portion of it is also excreted by the milk to which it imparts its nauseous flavour.

Kidneys.—It powerfully stimulates the kidneys, perhaps more than any other drug containing either resins or volatile oils. It is therefore a powerful **diuretic**. This diuretic action is no doubt greatly due to the resin, which during its excretion locally stimulates the secreting cells of the kidneys. Large doses cause **renal congestion**, with lumbar pain, and scanty, bloody and albuminous urine. The resin and volatile oil are excreted in the urine and have an antiseptic action on it. As the resin is precipitated by nitric acid, it should not be mistaken for albumen. The resin is dissolved by heat or alcohol; moreover the resinous precipitate is evenly distributed in the fluid.

It should be remembered that the resin is inferior to the oil as an antiseptic, but is a powerful diuretic.

Micro-organisms.—By disinfecting the secretion of the genito-urinary tract as well as by rendering the urine aseptic, copaiba decidedly acts as a poison on many infective micro-organisms, especially the gonococcus, which is no doubt destroyed by the oleo-resin as it passes out.

THERAPEUTICS

Internally. Mucous membrane.—As a *stimulating disinfectant* to the mucous secretions, it has been found useful in **vaginitis**, **cystitis**, **pyelitis**, **leucorrhœa** and **chronic bronchitis**. Cystitis and leucorrhœa may as well be locally treated by injecting copaiba oil diluted with its own bulk of warm castor oil. But it is rarely used in these cases.

Gonorrhœa.—On account of its *specific action on the gonococcus*, it is a very valuable medicine for **gonorrhœa** and **gleet**. It should be given when the acute symptoms have somewhat subsided. It should be given in 15 to 20 m. doses, increasing it slowly, as it often upsets the stomach. Its effect is not so marked on **gleet**, though it often benefits when locally administered.

Kidneys.—As a *powerful diuretic*, both copaiba and its resin have been employed in **dropsy**, due either to hepatic or cardiac disorder. It is contra-indicated in **Bright's disease**.

Prescribing hints.—Copaiba may be given in capsules, pills, paste, or solution as *Liq. Copaibæ*. It may be emulsified by the process described in page 82. Tincture of quillaia or solution of potash helps emulsification. Cinnamon water, peppermint water, tinctures of ginger and orange fairly cover its unpleasant smell. The oil is best given in capsules or suspended by mucilage. The efficacy of the drug is greatly increased if it is given with sandal-wood oil, cubeb oil, buchu, &c., as in the following prescription used by the writer invariably with success:—*Ol. Santal. Flav.* 4 drs., *Copaiba* 1 oz., *Liq. Potassæ* 1 dr., *Spt. Æther. Nitrosi* 4 drs., *Tr. Hyoseyam.* 4 drs., *Tr. Buchu* 1 oz., *Mucilag. Acaciæ* 1 oz., *Ol. Cinnamomi*, 10 ms., *Syrup* to 6 ozs. Mix and make a creamy emulsion. *Dose.*—One dessert-spoonful three daily after food.

CORIANDRI FRUCTUSCoriander Fruit. N.O. *Umbelliferae***Syn. I. V.**—*Dhanra*, Beng., Hind.**Habitat.**—Britain. Cultivated in India.**Source.**—The dried ripe fruit of *Coriandrum sativum*.**Characters.**—Nearly globular, $\frac{1}{2}$ in. in diameter, uniform, brownish-yellow, glabrous. Two mericarps closely united, and crowned by calyx-teeth and stylopod. Odour aromatic, especially when *bruised*. Taste agreeable.**Identification.**—Recognised by its characteristic appearance, odour and taste.**Composition.**—*Volatile Oil* (off.).**Action.**—Stimulant, carminative. *Dose.*—20 to 60 grs.**OLEUM CORIANDRI**

Oil of Coriander

Source and Characters.—A colourless or pale yellow oil obtained by distilling coriander fruit. (1 lb. of fruit yields about 42 grs. of oil.) *Solubility.*—2 in 1 of alcohol (90 p.c.). Sp. gr. 0.870 to 0.885.**Composition.**—(1) *Coriandrol*, up to 90 p.c. (2) *Pinene*.**Enters into.**—Syr. Sennæ. **B.P. Dose.**— $\frac{1}{2}$ to 3 ms.

PHARMACOLOGY AND THERAPEUTICS

The actions and uses of coriander fruit resemble more or less those of dill and anise fruits. The oil is specially used to render medicines more palatable and to prevent griping. The fruit is used in Indian cookery, and its mericarps are chewed with prepared *pan* or sometimes alone to remove the after-taste of drugs. The mericarps lightly fried and salted make a pleasant masticatory after meals.

COSCINIUM. *Coscini*N.O. *Menispermaceae*

(Ind. and Col. Addendum)

Syn.—False Calumba. **Syn. I. V.**—*Gách-haldi*, Beng. *Jhár-haldi*, Hind. *Dáru*, *Dáruharidrakam*, Sans. *Mara Munjil*, Tamil.**Habitat.**—India and Eastern Colonies.**Source.**—The dried stem of *Coscini* *fenestratum*.**Characters.**—In woody, cylindrical, straight, or twisted pieces, about 4 in. in diameter, furrowed longitudinally. Covered with a pale yellowish grey cork. No odour. Taste bitter.**Composition.**—(1) *Berberine*.

OFFICIAL PREPARATIONS

1. **Infusum Coscinii.**—Infuse $\frac{1}{2}$ hour. **B.P. Dose.**— $\frac{1}{2}$ to 1 oz.
2. **Liquor Coscinii Concentratus.**—1 in 2. By maceration and evaporation to 1 pint. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.
2. **Tinctura Coscinii.**—1 in 10. Macerate. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.

PHARMACOLOGY AND THERAPEUTICS

Internally.—Slices of the cut root are known as false calumba, because they act as a **bitter stomachic tonic** like calumba. It has been found to be an efficient bitter tonic after a long trial in the Madras hospitals.

The wood yields a yellow dye closely resembling turmeric.

CREOSOTUM. Creosote

Source.—A mixture of guaiacol, creosol, and other phenols, obtained in the distillation of wood-tar.

Characters.—A colourless or yellowish, highly refractive liquid with an empyreumatic odour and acid taste. Neutral or faintly acid in reaction. *Solubility.*—1 in 150 of cold, and more in hot water; freely in alcohol (90 p.c.), ether, chloroform, glycerin, and glacial acetic acid. *Impurities.*—Phenol, which hardens on cooling, and the less volatile liquids.

Identification.—Its characteristic smell helps recognition, but it should not be mistaken for that of carbolic acid. Its colour is not reliable.

Composition.—(1) *Guaiacol*, soluble 1 in 80 of water, and freely in alcohol (90 p.c.), glycerin, and fixed oils. (2) *Creosol*, soluble 1 in 150 of water, and sparingly in glycerin.

Incompatibles.—Silver salts (*see* p. 109).

Action.—Antiseptic, disinfectant, deodorant.

B.P. Dose.—1 to 5 *ms.* *Max. Dose.*—30 to 60 *ms.* gradually increased.

OFFICIAL PREPARATIONS

1. **Mistura Creosoti.**—1 m. in 1 oz. **B.P. Dose.**— $\frac{1}{2}$ to 1 oz.
2. **Unguentum Creosoti.**—1 in 10.

NON-OFFICIAL PREPARATIONS

1. **Oro-nasal Inhalations.**—Creosote or a mixture of Creosote, Phenol, Terebene, &c. Is used to medicate respirators.

2. **Vapor Creosoti.** **B.P. 1885.**—Creosote 12 *ms.*, Boiling Water 8 ozs. Useful in *phthisis*, *bronchitis*, *gangrene of the lungs*, &c.

3. **Creosotal.** *Syn.*—*Creosote Carbonate.*—A viscid, amber-coloured, almost odourless and tasteless liquid, insoluble in water, containing carbonates of guaiacol and creosol. *Dose.*—5 to 20 *grs.* in milk or emulsion.

4. **Creosote Phosphate.** *Syn.*—*Phosote.*—A yellowish oily liquid insoluble in water. *Dose.*—5 to 20 *grs.*

5. **Creosote Phosphite.** *Syn.*—*Phosphotal.*—In glacial crystals. *Dose.*—5 to 10 *grs.*

6. **Creosote Tannate.** *Syn.*—*Tannosal.*—A brown powder dusted like oloform, soluble in water. In *phthisis*. *Dose.*—5 to 15 *grs.*

7. **Creosote Valerianate.** *Syn.*—*Eosote.*—An oily liquid used in *phthisis* epidermically. Checks *gastric fermentation*. *Dose.*—4 to 12 *grs.*

8. **Creosiform.**—A compound of creosote and formaldehyde.

9. **Guaiacform,** a similar combination with guaiacol.

10. **Guaiacol.**—*Medicinal guaiacol* is the chief constituent of beech creosote. *Synthetic guaiacol* is prepared from pyrocatechin crystals. Considered to have **lethal action** on **bacilli of tuberculosis**. Used as a

substitute for creosote. Acts as **antipyretic** when injected into or painted over painful nerves. Sometimes it produces cardiac weakness. *Dose*.—1 to 5 ms. May be hypodermically injected dissolved in almond or olive oil.

11. **Novocol**.—*Sodium guaiacol-monophosphate*. In white crystalline powder, soluble in water. 50 p.c. of guaiacol which is liberated on contact with an alkali. In *tuberculosis*, *chronic bronchitis*, &c. *Dose*.—4 to 8 grs. thrice a day.

12. **Guaiacol Benzoas**. *Syn.*—*Benzosol*.—In colourless, almost odourless and tasteless crystals. It is less nauseous, but it is difficult to get it pure. Useful in *incipient phthisis*. *Dose*.—4 to 12 grs.

13. **Guaiacol Carbonas**. *Syn.*—*Duotal*.—A colourless crystalline, tasteless powder. Used as a substitute for guaiacol, with sugar or in cachets. This is largely used in *phthisis*. *Dose*.—3 to 8 grs., increased to 100 grs per diem.

14. **Guaiacol Valerianas**. *Syn.*—*Geosol*.—A liquid combination of Valerianic Acid and Guaiacol. *Dose*.—3 to 8 ms. in capsules.

15. **Guaiacetin**. *Syn.*—*Sodium Pyro-catechin-mono-acetate*. *Dose*.—5 to 8 grs.

16. **Guaiacol Salol**. *Syn.*—*G. Salicylate*.—A good intestinal disinfectant. *Dose*.—15 to 75 grs.

17. **Thiocol**. *Syn.*—*Potassium - guaiacol - sulphonate*.—Odourless white crystals, soluble in water. Has a pleasant taste, and does not irritate even when administered hypodermically. The appetite is sharpened as it is always well borne. Combines the good effects of creosote and guaiacol without their disadvantages. Especially useful for children. Has given excellent results in *phthisis* and *intestinal tuberculosis* and is a satisfactory substitute for quinine in *malaria* in cases where that drug is not tolerated. *Dose*.—15 grs.

18. **Guaethol**. *Syn.*—*Ajacol*.—Pyrocatechin-mono-ethyl-ester. An astringent liquid. Allays pain.

19. **Guaiacol Camphorate**. *Syn.*—*Guaicamphol*.—A combination of guaiacol and camphoric acid. For *night sweats* of *phthisis*. *Dose*.—5 to 10 grs.

20. **Guaiacol Cinnamate**. *Syn.*—*Styracol*.—For *intestinal phthisis*. *Dose*.—5 to 15 grs.

21. **Guaiacol Phosphite**. *Syn.*—*Guaico-phosphal*.—White glistening crystals. For *tuberculosis*. *Dose*.—6 to 10 grs.

PHARMACOLOGY

Externally.—The action of creosote is very similar to that of caradac, creosote being an **antiseptic**, **disinfectant**, and **deodorant**, but as it is a complex product, its action is not always uniform, cannot therefore be relied upon. Painted like guaiacol or rubbed on the skin it acts as an **antipyretic**.

Internally. **Gastro-intestinal tract**.—When applied to the mouth, it produces smarting and salivation, and destroys epithelium. In the stomach, it is supposed to depress the terminal filaments of the sensory nerves of the mucous membrane, and to arrest **putrefactive** and **fermentative processes** by destroying low forms of vegetable life such as *torulæ* and *sarcinæ* without affecting the pepsin.

doses cause nausea, vomiting, colic and diarrhoea, with frequent pulse and slow and laboured respiration, without producing any convulsions.

Secretions.—It is readily absorbed into the blood, and undergoes no change in it. It is eliminated by the **bronchial mucous membrane** and **kidneys**, which it stimulates, increasing the bronchial and urinary secretions, and if foetid removing their factor.

Micro-organisms.—It seems to act as a poison to microbes, especially to tubercle bacilli, either during the process of elimination, or when locally brought into contact with them, as by inhalation.

THERAPEUTICS

Externally.—Like carbolic acid, it cannot be used as a **general antiseptic** on account of its indefinite composition. The official ointment is useful in **ulcers, scaly skin diseases** and some forms of **eczema**. Creosote vapour or creosote spray is a useful inhalation in **chronic bronchitis, phthisis, gangrene** of the lungs, &c. A few drops of creosote rubbed into the pit of the stomach, the part being afterwards covered with cotton-wool, will often bring down the temperature in cases of fever where all other means have failed.

Internally. Gastro-intestinal tract.—A pellet of cotton-wool soaked in creosote relieves **toothache** when introduced into the cavity of the painful carious tooth. In minute doses, 1 to 3 ms., it has been found to relieve **nausea, vomiting** and **gastralgia**, caused either by any local mischief or by reflex irritation. It checks also **fermentative dyspepsia** and **diarrhoea**, when given with bismuth and alkalis. It is an excellent remedy for **sloughing dysentery**. Dr. V. de Holstein considers it to be the most effective remedy for **chronic constipation**, in 1 to 2 ms. doses gradually increased to 7 to 8 ms.

Lungs.—Both creosote and guaiacol are considered to be almost specifics for **phthisis**, because of their lethal effects on the tubercle bacilli. They must be commenced early and continued long and in increasing doses. The sooner the constitution is brought thoroughly under the influence of the drug the better. Commencing with 5 to 10 ms. doses, it may be increased up to 60 ms. Guaiacol carbonate and thiocol are better borne than creosote, and they may with advantage be combined with quinine.

Prescribing hints.—Creosote may be given by the mouth, rectum, hypodermically mixed with almond oil, rubbed into or applied to the skin, or inhaled. By the mouth it is best given in pilules, capsules, perles, emulsions or mixed with milk or cod-liver oil. Sometimes the mucous secretion of phthisis is wonderfully decreased by using the creosote spray. During hæmoptysis creosote treatment must be stopped. It sometimes keeps up the expectoration and a mild form of hæmoptysis, if continued too long.

The creosote draught of the Victoria Park Hospital is a far better preparation than the official Mist. Creosoti. It consists of Creosote

5 to 30 ms., Tinct. Gentiani Co. 15 ms., Alcohol (90 p.c.) 15 ms., Ext. Glycyrrhizæ Liq. 30 ms., Water 1 oz. Martindale's Pil. Creosoti, which consists of equal parts of creosote and curd soap, is also an excellent formula.

For inhalation creosote may either be given alone or mixed with phenol upon a respirator, or it may be used in the form of the Vapor Creosoti. The Brompton formula is creosote 1, spirit of menthol (20 p.c.) 1, spirit of chloroform 1. The addition of spirit of chloroform makes it more sedative in its action.

CRETA PRÆPARATA. See page 297

CROCUS. Saffron

N.O. *Iridaceæ*

Syn. I. V.—*Jáfrán*, Beng. *Keshar*, Hind. *Kumkuma*, Sans.

Habitat.—Spain, Kashmir, Persia.

Source.—The dried stigmas and tops of the styles of *Crocus sativus*.

Characters.—Each portion 1 in. long, consists of three orange-red stigmas, thickened and tubular above, notched at the extremities, and united below to the top of the yellow style. Flexible and unctuous to touch; odour aromatic; taste bitter, aromatic; imparts an orange-yellow colour to the fingers when rubbed, and to warm water. **Impurities.**—Marigold and saffron petals, stamens, chalk, coloured powders, oil, barium, sulphate, lime, magnesia, &c.

Identification.—Its characters and flavour are characteristic. A lens may be used to distinguish foreign substances.

Composition.—(1) *Polychroite* or *Crocin*, an orange-red glucoside. (2) *A Volatile Oil*.

Enters into.—Decoct. Aloes Co., Tr. Cinch. Co., and the

OFFICIAL PREPARATION

1. **Tinctura Croci.**—1 in 20. Bright yellowish-brown. **B.P. Dose.**—5 to 15 ms.

USES

Saffron is chiefly used as a colouring and flavouring agent, but it is very expensive. Many Indian dishes are coloured and flavoured by it.

CROTONIS OLEUM

Croton Oil. N.O. *Euphorbiaceæ*

Syn. I. V.—*Jaipaler tel*, *Jamalgota ke tel*, Hind.

Habitat.—India, Ceylon, Indian Archipelago.

Source.—The oil expressed from the seeds of *Croton tiglium*.

Characters.—Brownish-yellow to dark reddish-brown, viscid. Odour disagreeable. Taste acrid, burning. **Solubility.**—In ether, chloroform, olive oil, freely in absolute alcohol.

Identification of seeds.—The seeds are non official, but their appearance should be known. They are oval or oblong, dark brown, marked with

ramifications of the raphe. They resemble castor-oil seeds, which are brighter, polished and mottled.

Composition.—(1) *Glyceryl of Crotonoleic Acid*, which appears to be the active principle. (2) *Tiglic Acid or Methyl Crotonic Acid*. (3) *Crotonol*, which is non-purgative, but an irritant to the skin. (4) Several *volatile acids*, to which the odour is due. (5) Several *fatty acids*.

Action.—Pustulant, drastic purgative. **B.P. Dose.**— $\frac{1}{4}$ to 1 m.

OFFICIAL PREPARATION

1. **Linimentum Crotonis.**—1 in 8. A counter-irritant.

PHARMACOLOGY

Externally.—Croton oil is a powerful irritant to the skin, producing burning, redness and a crop of vesicles, which soon turn into pustules, leaving unsightly scars. Its action is intensified by mixture with alkalis.

Internally. Gastro-intestinal tract.—Taken undiluted it is an irritant to the mouth and fauces. In a short time after a drop has been swallowed, griping and abdominal heat and pain are felt; followed in an hour or two by repeated purging; the stools becoming more and more watery and the intervals shorter and shorter. It is therefore a **drastic purgative**. This action is probably due to its direct irritant effect on the stomach and intestines. The mucous membrane becomes red and cedematous and both intestinal peristalsis and secretion are considerably increased. Its action is greatly heightened by the bile salts and other alkaline secretions in the small intestine. In large doses the stools towards the end contain blood and mucus, and there is considerable general depression, leading sometimes to death from collapse. The action of croton oil is not entirely local, for it may purge if it is applied to the skin. It is not a hepatic stimulant.

Antidotes.—In the case of an overdose of, or poisoning by, croton oil, wash out the stomach with gruel and mustard, or olive oil, or diluted milk (4 ozs. in 1 pint of water), and give demulcent drinks, such as linseed tea, milk-whey, gruel, &c. Opium internally or by enema, stimulants, &c.

THERAPEUTICS

Externally.—As a counter-irritant it is scarcely used now, though in former days the liniment was employed in **phthisis**, acute and chronic **bronchitis**, **pleurisy** and in chronic inflammatory conditions of the joints. The oil is recommended in obstinate **ringworm** of the scalp, but the risk of suppuration and baldness counterbalances its advantages. The diluted liniment, or croton oil well diluted with olive oil (5 ms. to 1 oz.) is sometimes used in **alopecia**, but cantharides is a better and safer hair restorer.

Internally.—Croton oil is used only on rare occasions. As a *purgative* it is invaluable in **cerebral hæmorrhage**, **coma**, and **insanity** on account of its minute dose and the rapid and complete evacuation

of the bowels which it causes. In **obstinate constipation** and **intestinal obstruction** from impacted faeces, where there is no structural or inflammatory complication, croton oil may be given with benefit, but not till other purgatives have been tried. According to Brunton, croton oil 1 drop with 1 dr. of chloroform in glycerin 1 oz. removes **tapeworm** when other remedies fail. It may also be given in **dropsy**, **hydrocephalus**, **uræmia**, **delirium tremens**, &c.

Caution.—It must not be given to weak subjects, pregnant women, children, and those who suffer from piles, prolapse of the rectum, or chronic diarrhoea and chronic dysentery. It is inadmissible in inflammatory conditions of the stomach, intestines and peritoneum, and in organic obstruction of the bowels.

Prescribing hints.—Croton oil is usually given in pill (*see* p. 88) alone or mixed with compound colocynth pill. When patients are unconscious, as in apoplexy, the best method of administration is to mix it with butter or brown sugar and place it on the back of the tongue. If used externally, vesication should be avoided and the patient warned against conveying the application to the face or scrotum, lest it should cause a severe inflammation. The maximum dose should not exceed 2 ms. a day.

CUBEBAE FRUCTUS

Cubebs. N.O. *Piperaceæ*

Syn. I. V.—*Kábáb chini*, Beng., Hind.

Habitat.—Java and the Moluccas.

Source.—The dried full-grown unripe fruit of *Piper cubeba*.

Characters.—Globular, $\frac{1}{2}$ in. in diameter, black, wrinkled, tapering below into a rounded stalk, odour strong, aromatic; taste bitter, aromatic. Genuine crushed fruit imparts a crimson colour to H_2SO_4 .

Identification.—Cubebs may be mistaken for Pepper and Pimento, but the wrinkled black appearance with the stalk attached, and its characteristic odour at once identify it. Powdered cubebs is reddish-brown and has a characteristic odour.

Composition.—(1) The *volatile oil* (*off.*) 6 to 15 p.c. (2) *Cubebin*, a neutral body. (3) An oleo-resin containing *cubebic acid* and *cubebin*. (4) *Piperine*. (5) A *fatty oil*. (6) *Gum*.

Action.—Aromatic, stimulant, diuretic. **B.P. Dose.**—30 to 60 grs.

OFFICIAL PREPARATIONS

1. **Oleum Cubebae.**—A pale green, yellow, or colourless oil, smelling of cubebs, distilled from cubebs. Sp. gr. 0.910 to 0.930. **B.P. Dose.**—5 to 20 ms.

2. **Tinctura Cubebae.**—1 in 5. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.

PHARMACOLOGY

Externally.—The action of cubebs depends upon the oil and the resin which it contains. It causes **rubefaction** when rubbed into the skin.

Internally. Gastro-intestinal tract.—The action of cubebs here resembles that of pepper. In small doses, it is a **stimulant, stomachic** and **carminative**, and in large doses it impairs digestion. In still larger doses it causes **gastro-intestinal irritation**.

Respiratory and genito-urinary tracts.—Like many oleo-resins, cubebs enters the blood and is carried to different tissues and organs, upon which it acts more or less like copaiba. It **stimulates** the **secretions** of the mucous membranes of the **respiratory** and **genito-urinary passages** and renders them aseptic. It also stimulates the action of the kidneys, and to some extent that of the skin. Sometimes it causes **erythema**.

Elimination.—It is chiefly excreted in the bronchial secretion and urine, and is probably found in the latter in the form of a salt of cubebic acid, which may be precipitated by HNO_3 . Many of the specific germs are destroyed by the products of the volatile oil as they pass out.

THERAPEUTICS

Internally.—Unlike copaiba, cubebs is often used in the form of lozenges or inhalation to relieve **coughs, colds** and **sore throat**. The cigarettes sometimes relieve a fit of **asthma**. On account of its specific action on the genito-urinary passages, it is often largely employed with copaiba in acute or chronic **gonorrhœa, gleet, cystitis**.

Prescribing hints.—The powdered cubebs may be given in lozenges, cachets, or as a paste with copaiba and the oil in capsules, or in emulsion, often with copaiba, buchu, &c. (see p. 369).

CUCURBITÆ SEMINA PRÆPARATA

N.O. *Cucurbitaceæ*

Melon Pumpkin Seeds. Red Gourd Seeds

(*Ind. and Col. Addendum*)

Syn. I. V.—*Bilāti Kumrār bij*, Beng. *Mithākadu kā bij*, Hind.

Habitat.—Mediterranean Colonies.

Source.—The prepared fresh ripe seeds of cultivated plants of *Cucurbita maxima* (*Cucurbita Pepo*).

Characters.—Flat, ovate, white exalbuminous, consisting of two cotyledons deprived of testa and tegmen. The seeds must not be more than one month old.

Composition.—(1) An Oil, expressed from the seeds.

B.P. Dose.—3 to 4 ozs.

PHARMACOLOGY AND THERAPEUTICS

Internally.—Both the seeds and the oil are efficient **anthelmintics** for **tapeworm**. The former are best given bruised with a little water or milk on an empty stomach early in the morning, followed by a

simple purgative at 10 A.M. ; the latter in $\frac{1}{2}$ oz. doses repeated at an interval of 2 hours and then followed by an aperient.

The plant, fruit and seeds are eaten by the people of India.

CUPRI SULPHAS

Copper Sulphate. $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$

Syn.—Blue Vitriol, Blue Stone. Cupric Sulphate. **Syn. I. V.**—*Tutia*, Beng., Hind.

Source.—Obtained by the interaction of water, sulphuric acid, and copper or cupric oxide.

Characters.—In blue triclinic prisms. **Solubility.**—1 in 3.5 of cold water. Solution acid. **Impurities.**—Iron and other metals.

Identification.—Its blue colour and shape help recognition.

Incompatibles.—Alkalis and their carbonates, lime water, mineral salts (except sulphates), iodides, and many vegetable astringents.

Action.—Caustic, astringent, emetic, tonic.

B.P. Dose.—As an astringent, $\frac{1}{4}$ to 2 grs. ; as an emetic, 5 to 10 grs.

NON-OFFICIAL PREPARATIONS

1. **Lapis Divinus, B.P.C.** **Syn.**—*Cuprum Aluminatum*.—Powdered Copper Sulphate, Potassium Nitrate and Alum, of each equal parts fused in an earthen crucible, $\frac{1}{10}$ th part of powdered camphor being added towards the end. 2 grs. in 1 oz. of distilled water makes a good **eye-wash**.

2. **Ung. Cupri Oleatis, B.P.C.**—Copper Oleate 1, Lard 9 ; melt and mix. An excellent antiseptic and parasiticide. Useful in *ringworm*, hard and horny *warts* and *corns*.

PHARMACOLOGY

Externally.—Copper sulphate has no action on the unbroken skin, but is a **caustic** when applied to a raw surface or a delicate mucous membrane, such as that of the conjunctiva. In diluted solutions it constricts local blood-vessels, and it is therefore a **local astringent**.

Internally. Gastro-intestinal tract.—It combines with the tartar of the base of the teeth, when long continued, and causes a characteristic green line. This line is not in the gums themselves as it is in Plumbism. In small medicinal doses, it acts as an **astringent**, and in large doses, 5 to 10 grs., as an **emetic** like zinc sulphate. Emesis is caused partly by its direct local action on the stomach, and partly by stimulation of the vomiting centre. It causes little depression and nausea. If it fails to induce vomiting, the stomach must be quickly emptied by other means, otherwise **gastro-enteritis** may result.

Remote action.—In minute doses copper sulphate is absorbed as an albuminate, and is said to act on the body like arsenic. It promotes assimilation and increases strength and flesh. Hence it is an **alterative** and **nervine tonic**. It paralyses the cardiac and the respiratory centres. During elimination through the intestinal mucous membrane, it acts as a **remote astringent**. It is stored in the liver.

Elimination.—Copper salts are thrown off by the gastro-intestinal mucous membrane, bile, urine, saliva, and sweat.

Acute toxic action is rare. In large doses copper salts produce violent gastrointestinal irritation, with paralysis of the cardiac and respiratory centres.

Antidotes.—Emetics or stomach pump if there is no free vomiting; white of egg, milk, or demulcent drinks, yellow prussiate of potassium, followed by opium and a warm poultice over the stomach.

Chronic toxic action.—Workers in copper or brass may suffer from anæmia, headache, debility, emaciation, indigestion, tremors, laryngeal and pharyngeal catarrh, occasional hæmoptysis, salivation, a green line at the bases of the teeth and occasional colic. In short a condition not unlike that of lead-poisoning.

THERAPEUTICS

Externally.—Copper sulphate is used to destroy **exuberant granulations**, and to stimulate **indolent ulcers**. Being not so strong as silver nitrate, it causes less pain when applied to **granular lids**, and to the edges of the eyelids in **tinea tarsi**. In the form of a lotion (2 to 4 grs. to 1 oz.) it is very serviceable in **sluggish ulcers** and **chancres**, and as an injection in **gonorrhœa**, **gleet** and **leucorrhœa**, but it must be remembered that copper lotions are more powerful than those of zinc sulphate.

Internally.—It is chiefly used for its **astringent** properties in obstinate **dysentery**, and **severe diarrhœa**, especially that of tuberculosis. For its **emetic** action, it is occasionally used in narcotic poisoning, and to expel false membranes or mucus from the air-passages in **diphtheria**, **laryngitis**, **croup** and **bronchitis**, especially where *pecacuanha* fails. It is a valuable **antidote** in **poisoning** by **phosphorus**, for copper is deposited over phosphorus which is rendered inert. 3 grs. of copper sulphate should be given every few minutes until vomiting is induced and then a saline laxative. As a tonic it has been given in **epilepsy**, but without much success. It is said to cure **chlorosis**.

CUSPARIÆ CORTEX

Cusparia Bark. N.O. *Rutaceæ*

Syn.—*Angustura bark*.

Habitat.—Tropical South America.

Source.—The dried bark of *Cusparia febrifuga*.

Characters.—In flattened or curved pieces or quills, 4 or 5 in. long, 1 in. wide, $\frac{1}{2}$ in. thick. Outer layer grey or yellowish corky which can be removed, disclosing a hard dark brown inner layer. Inner surface light brown and laminated. Fracture short, resinous, showing white points. Odour musty. Taste bitter. **Impurity.**—Bark of *Strychnos Nux Vomica* (false angustura bark), whose inner surface gives a bright blood-red colour with HNO_3 indicating *brucine*; whilst cusparia bark does not.

Composition.—(1) *Cusparine* or *Angusturine*, a crystalline bitter alkaloid. (2) *Galipeine*, an alkaloid. (3) *Galipidene*, an alkaloid. (4) *Cusparidine*, also an alkaloid. (5) An *Aromatic Oil*. No tannin.

Incompatibles.—Mineral acids and metallic salts.

Action.—Bitter tonic.

OFFICIAL PREPARATIONS

1. *Infusum Cuspariæ*.—1 in 20 ($\frac{1}{4}$ hour). B.P. Dose.—1 to 2 ozs.
2. *Liquor Cuspariæ Concentratus*.—1 in 2. B.P. Dose.— $\frac{1}{2}$ to 1 dr.

PHARMACOLOGY AND THERAPEUTICS

Cusparia is used to make angustura bitters. It has **aromatic, tonic and febrifuge** properties, and in large doses produces gastro-intestinal irritation. It is useful in **tropical fevers**, especially **intermittents**, and in **dysentery**. It is largely employed in South America.

CUSSO. KoussoN.O. *Rosaceæ***Habitat.**—Abyssinia.**Source.**—The dried panicles of pistillate flowers of *Brayera anthelmintica*.

Characters.—In cylindrical rolls, 1 to 2 ft. long. The panicles much branched, the branches arising from the axils of large sheathing bracts, covered with hairs and glands. Flowers numerous, small, shortly stalked, unisexual, with two roundish membranous veined bracts at the base. Calyx hairy, veined, with two whorls of five segments each. No odour. Taste bitter, acrid.

Composition.—(1) *Koussin*, or Koussotoxin, a neutral active principle.
(2) *Oil, Gum, Resin, and Tannic Acid*.

Action.—Anthelmintic for tapeworm. B.P. Dose.— $\frac{1}{2}$ to $\frac{1}{4}$ oz.

PHARMACOLOGY AND THERAPEUTICS

In official doses kousso is a valuable **anthelmintic** for all three varieties of tapeworm which are readily killed by it. It is not much used either in this country or in England. In large doses it causes vomiting and slight diarrhœa.

The powdered flower in compressed masses or suspended in an aromatic water is more efficacious than the infusion. The action of kousso is more certain when given on an empty stomach and followed by an aperient. The entozoa are expelled dead, and sometimes in pieces. The infusion may be prepared by boiling 2 to 4 drs. of the flower in 4 ozs. of boiling water for $\frac{1}{4}$ hour. It should not be strained.

DATURÆ FOLIADatura Leaves. N.O. *Solanaceæ**(Ind. and Col. Addendum)***Habitat.**—India, Eastern and West Indian Colonies.**Source.**—The dried leaves of *Datura fastuosa* and of *Datura metel*.

Characters.—Ovate acuminate, with long petioles and sinuate, dentate margins. 7 to 8 in. long, 4 to 5 in. broad. Odour characteristic. Taste bitter.

DATURÆ SEMINA. *Datura* Seeds*(Ind. and Col. Addendum)***Source.**—The dried seeds of *Datura fastuosa*.**Characters.**—Wedge-shaped; rounded, thickened, furrowed, wavy margins, compressed laterally; $\frac{1}{4}$ to $\frac{1}{2}$ in. broad, $\frac{1}{16}$ in. thick. Hilum on one edge. Testa finely pitted, reticulated. Taste bitter.

OFFICIAL PREPARATION

1. **Tinctura Daturæ Seminum.**—Seeds bruised 5 ozs., Alcohol (70 p.c.) *q.s.* to 1 pint. By percolation. **B.P. Dose.**—5 to 15 ms.

PHARMACOLOGY AND THERAPEUTICS

The action and uses of the leaves and seeds are the same as those of stramonium leaves and seeds (*q.v.*).**DIGITALIS FOLIA**Digitalis Leaves. N.O. *Scrofulariaceæ***Habitat.**—Britain.**Source.**—The dried leaves of *Digitalis purpurea*, the Purple Foxglove, collected from plants commencing to flower.**Characters.**—4 to 12 in. long, up to 6 in. broad, with a winged petiole, ovate or ovate-lanceolate, subacute, crenate. Upper surface somewhat rugose, dull green, slightly hairy. Under surface paler, pubescent, with prominent veins. No odour. Taste very bitter.**Identification.**—The crenate-dentate margin and the prominent white network of veins on the under surface at once enable a student to recognise it. The latter character may help him to make it out even when in fragments.**Composition.**—Five active principles (all glucosides).—(1) *Digitonin*. (2) *Digitalcin*. (3) *Digitalin*. (4) *Digitoxin*. (5) *Digitin*. Two acids.—(1) *Digitalic* and (2) *Antirrhinc*. Other constituents, as starch, colouring matter, gum, tannin, volatile oil, salts, and sugar.**Incompatibles.**—Iron persalts, lead acetate, cinchona. In practice it is often given with iron and cinchona.**Action.**—Cardiac tonic, diuretic. **B.P. Dose.**— $\frac{1}{2}$ to 2 grs.

OFFICIAL PREPARATIONS

1. **Infusum Digitalis.**—1 in 160 nearly. Contains more digitonin, which is allied to saponin, and is therefore a more active diuretic. **B.P. Dose.**—2 to 4 drs.2. **Tinctura Digitalis.**—1 in 8. Dark brown. **B.P. Dose.**—5 to 15 ms.

NON-OFFICIAL PREPARATIONS

1. **Inf. Digitalis Conc. B.P.C.**—Leaves 480 grs., Alcohol (90 p.c.) 5 ozs., Water *q.s.* to 1 pint. Thrice macerated. Has eight times the strength of *Inf. digitalis*. **Dose.**—15 to 30 ms.

2. **Pil. Hyd. et Digit. Comp. St. Bart.**—Mercurial pill 1 gr., Digitalis 1 gr., Squill 1 gr., Ext. of Henbane 2 grs.

3. **Succus Digitalis. B.P.C.**—Juice 3, Alcohol (90 p.c.) 1. *Dose.*—5 to 10 ms.

4. **Digitalin.**—Under this name four varieties are found in the market :—
(a) **Amorphous Digitalin (Homolle).**—Is of uncertain composition and is not much used now. *Dose.*— $\frac{1}{10}$ to $\frac{1}{5}$ gr. in granules.

(b) **Crystallized Digitalin (Nativelle).**—Consists mostly of digitoxin in light-white needles, soluble in chloroform, insoluble in water. Is cumulative. *Dose.*— $\frac{1}{10}$ to $\frac{1}{5}$ gr. in pill.

(c) **German Digitalin.**—Consists mostly of digitalein, with some digitonin and digitalin. Amorphous, soluble in water. *Is most suitable for hypodermic use.* *Dose.*— $\frac{1}{10}$ to $\frac{1}{5}$ gr.

(d) **Pure Digitalin.**—A crystalline glucoside. Soluble 1 in 1000 of water. *Dose.*— $\frac{1}{10}$ to $\frac{1}{5}$ gr. hypodermically.

5. **Digitoxin (Merck).**—In minute white crystals. Recent investigators consider it to be the active principle. *Dose.*— $\frac{1}{10}$ to $\frac{1}{5}$ gr. Best given in solution in glycerio-alcohols.

6. **Tabellæ Digitalini et Nitroglycerini.**— $\frac{1}{10}$ gr. each.

PHARMACOLOGY

Externally.—The leaves gently irritate the skin. The writer has seen a case in which mild toxic symptoms were produced by their application to the inflamed scrotum after they had been softened by soaking in hot water.

Internally. Gastro-intestinal canal.—Small doses appear to have no action. Large and continued doses induce vomiting and purging. Digitalis is therefore a **mild gastro-intestinal irritant.**

Blood.—Its active principles are readily absorbed, but they are not known to affect the blood.

Heart.—Digitalis acts both on the heart and on the blood-vessels. It (1) **slows the beat** of the heart, (2) **increases the force** of the systole, and (3) **lengthens the diastole** without affecting the duration of systole. Consequently the **pulse** is slowed and steadied and its tone is improved. Digitalis therefore is of therapeutic value in several different ways :—

(a) The slowing of the heart allows the left ventricle to be better filled and a larger wave of blood sent into the aorta,

(b) it removes the "waterlogging" of the venous system,

(c) it lessens pulmonary engorgement,

(d) it checks mitral regurgitation in cases of valvular lesion.

Further Dr. Hare has shown by administering digitalis to young pigs for four and a half months, that there are genuine growth and hypertrophy of the cardiac muscle as well as **an increase in the weight of the organ.** It has also been observed that in small doses digitalis **actually increases the amount of work** done in a given time, i.e. a greater output with each ventricular contraction.

The action of digitalis on the heart is very complicated, and is

chiefly due to (1) the **direct action** of digitalis on the **involuntary muscular fibre** of the heart, (2) **increased activity** of the **inhibitory fibres** of the **vagus**, and (3) partly to the **stimulation** of the **vagal centre**. According to Cushny the vagal action commences a little before the muscular.

Blood-vessels.—In moderate doses digitalis greatly **increases the blood-pressure**, caused partly by the **greater cardiac force**, and partly by the **contraction of the arterioles**, from its direct action on their **involuntary muscular fibre**, and perhaps on the nervous apparatus (?) contained in the arteries, as has been pointed out by Brunton. The **vaso-motor centres** in the **medulla** and **cord** are also slightly stimulated by digitalis, and this, to a certain extent, contributes to the rise of the blood-pressure. In toxic doses digitalis paralyzes the vagal and other centres, as well as the muscular coat of the arterioles, and therefore the blood-pressure falls from the relaxation of the vessels.

The action of digitalis on the blood-pressure of an animal, as is seen from a tracing taken by Dr. Tunnicliffe, may fairly be divided into four stages thus :—

First.—Slowing of the heart (pulse), rise of the blood-pressure, and greater oscillations due to the action of digitalis on the heart and contraction of the arterioles.

Second.—Very rapid pulse and still high blood-pressure, due to the depression of the vagus; the contraction of the arterioles being maintained.

Third.—Still rapid pulse, beginning of the relaxation of the vessels, and falling of the blood-pressure.

Fourth.—Further diminution of the pressure, weakening and again slowing of the pulse, from the paralysis of the heart (*see* “Action of Medicines,” by Brunton, 1901, p. 313).

From what has just been stated it becomes evident that the pulse alters materially in character with the amount of the drug administered. It becomes at first slow, then gradually intermittent, then more frequent though still intermittent and lastly rapid but fairly regular. The effects pass off in the reverse order.

Respiration.—This is only secondarily affected from imperfect circulation in toxic doses.

Temperature.—In medicinal doses it has no influence on the temperature, but in toxic doses it reduces it even in health. How this occurs we do not know.

Nervous system.—In medicinal doses it has no influence on the brain, cord, and sensory and motor nerves. In large doses it causes giddiness, headache, dimness of sight and disturbed hearing. Flashes of light, and a blue halo around bright objects also appear before the eyes. All these symptoms are probably due to some disturbance in the cerebral circulation. The reflex excitability and motor nerves are depressed only by toxic doses.

Kidney.—The action of digitalis on this organ is uncertain. In health, it may or may not cause diuresis. Lauder Brunton by experiments on his own person has found "while small doses have little or no action, marked diuresis occurs when the drug is pushed so as to produce symptoms of poisoning." But other observers have obtained different results. In heart disease it very often acts as a powerful **diuretic**, though not always so. The cause of this uncertainty of action may be explained, if we accept the theory that if the arterioles of the kidneys like the rest of the body are tightly contracted, very little blood will flow through them and therefore little urine will be secreted; but, if on the other hand, the renal vessels are not so much contracted, the increased cardiac force and the rise of the blood-pressure will drive more blood to the kidney, and there will consequently be a free diuresis. Some consider that in small doses, the vessels of the kidney are constricted along with the rest of the body, and the quantity of urine secreted is therefore diminished. But as the renal arterioles are the first to dilate while the general blood-pressure is still high, free diuresis ensues. Kobert has shown that digitalin contracts all vessels while digitoxin and digitalein dilate the renal vessels while contracting all others. It is a known fact that the leaves which contain more digitonin (*see* p. 381) are most powerfully diuretic.

It has no action, as far as we know, on the composition of the urine.

Uterus.—The muscular fibres are supposed to be stimulated to contraction.

Cumulative action.—Digitalis when given for a long time, sometimes suddenly causes symptoms of poisoning even when its dose has not been increased. This is known as the **cumulative effect of the drug**, and is due to the retardation of its excretion by the kidneys from the contraction of the renal vessels. The active principles, not being eliminated as fast as they are absorbed accumulate in the system. The first indication of this cumulative action is scanty secretion of urine.

Elimination.—It is chiefly excreted by the kidneys and partly by the gastro-intestinal mucous membrane.

Toxic action.—Large doses cause nausea, vomiting, and purging; the vomit is grass-green, the change in colour being probably due to the action of gastric juice on some ingredients of digitalis. The other symptoms have already been described.

Antidotes.—Emetics or pump. Strong coffee, or tannin in solution and in large draughts. Stimulants—brandy, whisky, ammonia, &c. Warmth to the extremities. Aconite (5 mss. of tincture) or Aconitine $\frac{1}{16}$ gr. hypodermically. Opium. Absolute rest and *recumbent position* are essential.

Physiological antagonists.—Aconitine, muscarine, scoparin and saponin. Aconite is practically the only one of these that is used as

an antidote. We therefore append a table showing the comparative antagonism between digitalis and aconite.

Digitalis

1. A powerful cardiac tonic. The force of cardiac contraction is increased.

2. The arterial tension is increased from contraction of the vessels.

3. The blood-pressure rises considerably.

4. A powerful diuretic in certain conditions.

Aconite

A powerful cardiac sedative. The force of cardiac contraction is diminished.

The arterial tension is diminished from relaxation of the vessels.

The blood-pressure falls considerably.

A feeble diuretic in certain conditions.

Resemblance of action.—The following drugs more or less resemble digitalis in action on the circulatory system: *Strophanthus*, *erythrophlœum* (casca bark), *adonis vernalis*, *convallaria majalis*, *cactus grandiflora*, *scillain* (scilla), *sparteine* (broom), *heleborein* (*helieborus niger*), and *barium chloride*.

THERAPEUTICS

Externally.—Poultices of digitalis leaves are occasionally used in cases of suppression of urine, but it is doubtful whether they are of any real value.

Internally.—It is the most valuable remedy we have for certain diseases of the heart; it affords relief, according to Ringer, in one or more of the following ways:—

1. By strengthening the action of a weak heart.
2. By reducing the strength of the beats of a heart acting too powerfully.
3. By lessening the frequency of the heart's beats.
4. By correcting irregular action of the heart.
5. By increasing tonicity and so lessening the size of the cavities of the heart, thereby obviating the condition of over-distension in which the stretched ventricles are unable to contract upon their contents, a condition threatening complete asystole.

Mitral regurgitation and constriction.—Digitalis has a wonderful influence in restoring a dilated and weakened ventricle to a state of efficiency. Under its use a quick, weak and irregular contraction becomes slower, stronger and regular. As the diastolic period is prolonged, the heart gets more time for nutritive repair, and for more efficient subsequent contraction, from the flowing in of more blood from the dilated auricle and right side of the heart. By its powerful diuretic action, and lessened pressure in the pulmonary circulation, digitalis relieves dyspnoea, cough, venous engorgement of the lungs and of the abdominal organs, oedema, dropsey and many other symptoms due to mitral regurgitation. In short, digitalis is pre-eminently suited for cases of the "waterlogged" type.

It equally benefits **mitral constriction** by lengthening the period of diastole, and thereby allowing the normal amount of blood to pass through the constricted orifice. In proportion as this object is gained, the urgent symptoms are relieved. Dr. Hare has shown that it causes hypertrophy of the heart. It is therefore of great value in restoring the balance of the circulation in cases of ruptured compensation.

Tricuspid regurgitation and constriction.—Digitalis acts fairly well in diseases of the tricuspid valves, though not so well as in those of the mitral.

Aortic regurgitation, and obstruction.—In the first stage of **aortic regurgitation** digitalis is **useless** or sometimes positively **harmful**; but in the second stage, when the ventricle dilates, and the auriculo-ventricular orifice enlarges, producing **secondary mitral regurgitation**, digitalis then becomes of great value. But even then it must be given with great caution, for sudden syncope may occur if the patient does not keep to his bed. Cases of pure **obstruction** do not require any drugs, as compensatory hypertrophy may gradually take place without them. But when we wish to increase the contractile force of the heart in order to drive more blood through the obstructed aorta, or when from such an obstruction mitral disease has set in, digitalis in small doses does immense good. Unfortunately aortic obstruction is generally accompanied by aortic regurgitation; hence the difficulty of using digitalis.

Fatty heart.—Digitalis should not be given in **fatty degeneration** of the heart, as the increased force of systole may lead to rupture of the degenerated muscular fibres.

Other cardiac diseases.—In many primary diseases of the muscular structure, such as acute or chronic **myocarditis**, with or without vegetative growths, **pericarditis**, **endocarditis** with or without valvular lesions, digitalis helps to quiet and regulate the action of the heart. Many **functional diseases** of the heart, such as palpitation, irregular cardiac beat due to dyspepsia are benefited by digitalis, but it must be used with caution as it may bring on indigestion. In many **irritable conditions** of the heart, especially in persons who take excessively hard exercise, such as rowing or long marches with heavy knapsacks, or in persons of a neurotic temperament, digitalis is considered highly beneficial. The **dilatation** of the **right side** of the heart which so often accompanies chronic diseases of the lungs is also relieved by digitalis.

Renal diseases.—It is not safe to use digitalis in **acute Bright's disease** even as a diuretic, as it is not sound therapeutics to dilate the blood-vessels of an acutely inflamed organ; but when the kidney has become granular and the compensatory hypertrophy of the heart has not been sufficient to overcome the peripheral resistance, and ventricular dilatation and mitral regurgitation have set in, digitalis—especially the Guy's pill (digitalis, squill and blue pill each 1 gr.)—is of signal service. With this exception, digitalis is positively harmful

in chronic Bright's disease, as it increases the arterial tension which is already too high and may cause cerebral hæmorrhage.

Nervous diseases.—In **sleeplessness** at night followed by drowsiness in the day, in anæmic patients, digitalis may act as a **hypnotic** by restoring tone to the relaxed vessels. In moderate doses digitalis is said to be useful in **chronic delirium tremens**, but enormous doses ($\frac{1}{2}$ oz. of the tincture) as recommended by Jones are not safe.

Febrile and other diseases.—Digitalis is no longer used as a cardiac sedative, but as an antipyretic it is still occasionally used on the Continent. To tone up and slow the excessive action of the heart, digitalis is often prescribed in low forms of **remittent, intermittent, typhoid, scarlet and rheumatic fevers**. In **pneumonia** many advocate its use in larger doses, and its value as an adjunct to other treatment when given in moderate doses, has long been recognised. In **pleurisy**, when the heart becomes embarrassed by the effused fluid, the writer often uses the infusion as a cardiac tonic and diuretic.

Exophthalmic goitre.—Whether given alone or with iron and quinine, digitalis is considered to be a valuable medicine in this disease.

Hæmorrhage.—It is impossible to measure that stage in the action of digitalis, which only causes contraction of the arterioles without increasing blood-pressure. However, it is given in **epistaxis** and **hæmoptysis**. In **pulmonary hæmorrhage** due to valvular disease, it is very useful. In **menorrhagia** it may be usefully employed, as it tends to contract the uterine blood-vessels, but in hæmorrhage from a **fungoid growth** in the cervix it is entirely useless.

Caution.—(1) Suspend the administration, or reduce the dose, of digitalis on the first appearance of vomiting, or of a tendency to fainting, or of diminution in the secretion of urine.

(2) Never continue the digitalis treatment without intermission. After a week or ten days' use stop it for three or four days. When it is desirable to maintain the action on the heart, some other cardiac tonics, such as *strophanthus*, may be used alternately with digitalis.

(3) Never use digitalis in large doses unless you can see your patient very frequently, especially when the drug requires to be continued long.

(4) Always enjoin a perfect **recumbent position** during a course of digitalis treatment. Never allow your patient to get out of bed even to pass water or stools, or to sit up, particularly in a case of aortic regurgitation, lest there should be sudden fatal syncope.

(5) Never use digitalis if the vessels are **atheromatous**, or in a case of advanced Bright's disease, or of fatty heart.

(6) Examine the urine from time to time to ascertain the eliminatory functions of the kidneys.

Prescribing hints.—The fresh infusion and the tincture are the most reliable preparations. When the kidneys are to be acted upon, the infusion is to be preferred (*see* p. 381). Though incompatible with iron on account of the tannin it contains, digitalis is often advantageously given with iron; but, if this combination is used, the resulting

inky, ugly mixture should be cleared and made elegant by the addition of diluted phosphoric acid. When the full effects of digitalis are desired, the leaf may be prescribed either in powder or pill, as in Niemeyer's pill (digitalis $\frac{1}{2}$ gr., quinine 1 gr., opium $\frac{1}{4}$ gr.).

ELATERIUM. Elaterium

N.O. *Cucurbitaceæ*

Syn.—The Squirting Cucumber. **Syn. B.P. 85.**—Ext. Elaterii.

Habitat.—Britain (cultivated).

Source.—A sediment from the juice of the fruit of *Ecballium elaterium*.

Characters.—In light, friable, flat or slightly curved opaque cakes, $\frac{1}{16}$ in. thick, pale green or yellowish-grey. Odour faint, tea-like. Taste bitter, acrid. **Impurities.**—Starch, flour, chalk.

Identification.—It is easily recognised, as no other drug resembles it. The student should not taste it.

Composition.—(1) *Elaterin* (off.). (2) *Prophetin*, a glucoside. (3) *Gummy Matter*. (The official elaterium should contain 25 to 20 p.c. of elaterin).

Action.—A powerful hydragogue purgative.

B.P. Dose.— $\frac{1}{16}$ to $\frac{1}{2}$ gr.

ELATERINUM. Elaterin



Source.—The active principle of Elaterium.

Characters.—In small hexagonal scales, having a bitter taste, colourless. soluble in chloroform. **B.P. Dose.**— $\frac{1}{16}$ to $\frac{1}{32}$ gr.

OFFICIAL PREPARATION

1. **Pulvis Elaterini Compositus.**—1 in 40. **B.P. Dose.**—1 to 4 grs.

PHARMACOLOGY

Internally.—The action of elaterium is identical with that of colocynth, except that it is much more powerful (see p. 363). It produces numerous watery evacuations with considerable griping and prostration, and sometimes nausea, due to the strong stimulation of the glands and muscular coat of the intestines and of the liver. In large doses it causes **violent gastro-intestinal irritation** and occasionally even **peritonitis**. It must mix with the bile before it can operate. It is therefore, next to croton oil, the most **powerful hydragogue purgative** in the B.P. It increases salivary secretion, and when hypodermically injected it not only purges, but, according to Brunton, also causes tetanus and dyspnoea.

THERAPEUTICS

Internally.—Being a **violent drastic hydragogue purgative**, its use is indicated in cases when we want immediate copious evacuations of the bowels, as in **apoplexy, uræmia, œdema of the lungs, &c.** For the same reason it is largely employed in renal, hepatic and cardiac

dropsies, as in **Bright's disease**, **cirrhosis** of the **liver** and **mitral regurgitation**. It is rarely given in constipation.

Caution.—It should not be given to the weak, the old, the pregnant, and to those who suffer from habitual diarrhœa, chronic dysentery, piles, prolapse of the rectum, or cardiac weakness.

Prescribing hints.—The initial dose of elaterium should never exceed $\frac{1}{2}$ gr. and that of elaterin $\frac{1}{20}$ gr. Henbane and aromatic oil correct their griping property. The student should particularly remember the doses of the two drugs, and should not confound elaterium with elaterin. The compound elaterin powder is a safe preparation and may be given in powder or pill. If given in powder, it is better to mix it with butter and to put it on the back of the tongue, to be washed down with a spoonful of water. Elaterium does not keep well in hot climates and for that reason many of the samples that are found on the Indian market are almost inert.

EMBELIA. Embelia

N.O. *Myrsinaceæ*. (*Ind. and Col. Addendum*)

Syn. I. V.—*Biranga*, Beng. *Baberang*, Hind. *Vidanga*, Sans.

Habitat.—India and Eastern Colonies.

Source.—The fruit of *Embelia ribes* and of *Embelia robusta*.

Characters.—Globular, $\frac{1}{2}$ in. in diameter, dull red with dark spots to nearly black, containing a horny reddish seed. Taste slightly astringent, aromatic.

Composition.—(1) *Embelic acid* forming salts with ammonium, potassium, and sodium.

B.P. Dose.—1 to 4 drs. in powder.

NON-OFFICIAL PREPARATION

1. **Ammonii Embelas.**—In crystalline red needles. *Dose.*—3 to 6 grs. in honey or syrup.

PHARMACOLOGY AND THERAPEUTICS

These berries are considered a valuable **anthelmintic** for **tapeworm**, and may be used in powder or in infusion (without straining) for the same disease in India and Eastern Colonies. The taste is not unpleasant and the directions are the same as those given for the administration of *cusso* (see p. 380) or melon pumpkin seeds.

ERGOTA. Ergot

N.O. *Fungi* and *Graminaceæ*

Syn.—*Secale Cornutum*, Ergot of Rye.

Habitat.—Spain and Russia. (The Spanish Ergot is the best.)

Source.—The Sclerotium (mycelium or spawn) of *Claviceps purpurea* (N.O. *Fungi*), originating in the ovary of *Secale cereale*, the common rye (N.O. *Graminaceæ*). (Ergot is the diseased rye filled with the mycelium of a small fungus.)

Characters.—Subcylindrical or somewhat triangular, tapering, curved, $\frac{1}{8}$ to $1\frac{1}{2}$ in. long. Longitudinally furrowed, more on the concave side. Cracked, violet-black externally, pinkish-white within. Odour peculiar, disagreeable, especially if triturated with solution of potassium hydroxide. **Impurity.**—Musty ergot.

Identification.—The peculiar appearance and the odour are enough to identify it. The powder has a greyish-brown colour and a characteristic smell, though not infrequently this is disguised by that of camphor (*see below*).

Composition.—*Sphacelnic Acid* (its physiological activity is due to a body called sphacelo-toxin). (2) *Cornutine*, an alkaloid insoluble in water. (3) *Ergotinic Acid*, a glucoside. (4) *Ergotoxine* has of late been said to be the active ingredient. *Ergotininn* is the anhydride of it. (5) A fixed oil, 30 p.c. (6) *Trimethylamine*, which gives the odour. (7) *Tannin*, colouring matter, &c. (Its composition is as yet unknown.)

Incompatibles.—Metallic salts, astringents.

Dispensing hints.—The entire ergot should be carefully dried over quicklime, not by heat, and kept in perfectly dry air-tight bottles (*see* p. 7) with a little camphor, in order to preserve it from insects. The powdered drug deteriorates very rapidly.

Action.—Ecbolic, general hæmostatic.

B.P. Dose.—20 to 60 grs.

OFFICIAL PREPARATIONS

1. **Extractum Ergotæ.** *Syn.*—*Ergotin.*—**B.P. Dose.**—2 to 8 grs. in capsules
2. **Extractum Ergotæ Liquidum.**—1 in 1. **B.P. Dose.**—10 to 30 ms.
3. **Infusum Ergotæ.**—1 in 20. **B.P. Dose.**—1 to 2 ozs.
4. **Injectio Ergotæ Hypodermica.** *Syn.*—*Hypodermic Injection of Ergotin.*—1 in 3. **B.P. Dose.**—3 to 10 ms. hypodermically.
5. **Tinctura Ergotæ Ammoniata.**—1 in 4. (Ammonia exhausts ergot more efficiently. Kobert prefers an acid (HCl) exhaustive.) **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.

NON-OFFICIAL PREPARATIONS

1. **Acidum Scleroticum.** *Syn.*—*Sclerotinic Acid.*—A very active preparation. *Dose.*— $\frac{1}{4}$ to $\frac{1}{2}$ gr. hypodermically.
2. **Cornutine (Kobert).**—Brownish-grey, amorphous. An efficient hæmostatic. *Dose.*— $\frac{1}{8}$ to $\frac{1}{4}$ gr. daily, in divided doses. The hydrochloride and the citrate salts are more soluble.
3. **Ergotininae.** *Syn.*—*Ergotinine.*—An alkaloid in minute white crystals, insoluble in water, but soluble in alcohol and chloroform. *Dose.*— $\frac{1}{200}$ to $\frac{1}{10}$ gr. **Hypodermic injection.**—Ergotinine 1 gr., Lactic Acid 2 ms., Chloroform Water 1000 ms. *Dose.*—5 to 10 ms.
4. **Ergotininae Citras.**—A greyish powder. Soluble. *Dose.*— $\frac{1}{16}$ to $\frac{1}{10}$.
5. **Liq. Ergotæ Aceticus.** *Syn.*—*Extractum Ergotæ Fluidum U.S.*—Contains 2 p.c. of acetic acid, with dilute alcohol as a solvent. *Dose.*—10 to 60 ms.
6. **Liq. Ergotæ Ammon.**—1 in 1. An efficient and reliable preparation. *Dose.*—10 to 60 ms.

PHARMACOLOGY

Internally. **Gastro-intestinal canal.**—Ergot has a disagreeable bitter taste and increases salivary secretion. In moderate doses it

stimulates the involuntary muscles of the intestine, sometimes so strongly as to cause looseness of the bowels. In large doses it is a **gastro-intestinal irritant**.

Blood.—Its active principles readily enter the blood, but do not seem to affect its constitution.

Heart.—Ergot depresses the cardiac muscle and therefore slows the rate of the pulse. This slowing is due to the stimulation of the vagal terminal ends, since this does not occur if atropine is given before the administration of ergot. Consequently the **blood-pressure falls** at first.

Blood-vessels.—Very soon the **blood-pressure rises** from the **powerful contraction of the arterioles** all over the body, owing largely to its direct action on the involuntary muscular fibre in the arteries, and partly to the stimulation of the vaso-motor centres in the cord. Even the veins to some extent participate in this contraction. On account of the general vascular contraction together with the thickening of their walls produced by the sphacelinic acid, the coagulation of blood from a ruptured blood-vessel is greatly promoted; and ergot therefore acts as a powerful **general hæmostatic**. If this action continues long, "**gangrene** may set in different parts of the body, leading to **gangrenous ergotism**" (see p. 392). Toxic doses paralyse the vaso-motor centres and the cardiac muscle, thereby producing a fall of the **blood-pressure**.

Respiration.—Ergot slows respiration. Death occurs from asphyxia caused by the spasm and weakness of the respiratory muscles.

Nervous system.—It has little effect on the brain. The highest centres are not affected by medicinal doses, nor even by a single large dose. It produces changes of a sclerotic nature especially in the postero-external columns of the cord, and induces when it is given for a long time, a train of symptoms which are known as "**Spasmodic ergotism**."

Uterus.—Ergot powerfully contracts the impregnated uterus of women and of lower animals, especially when in labour, thereby expelling its contents. Hence it is a powerful **echolic**. But the contractions are more frequent than the normal ones and also more prolonged and irregular. In large doses it causes tetanic spasms. It is doubtful whether it acts at all as an **abortifacient** since it cannot cause contraction of the uterus, unless labour has already commenced. Upon the unimpregnated uterus it has little or no action. This action is probably due to the direct stimulation of the unstriped muscle of the womb, and partly to the stimulation of the uterine centre in the cord.

Secretion.—The secretion of saliva, sweat, milk and urine is diminished probably from the disturbance of the local blood-supply to the glands by the general vascular contraction.

Chronic toxic action or Ergotism.—Poisoning by ergot rarely occurs when used medicinally, but it is very frequently seen amongst the poor

who live on diseased rye. It then shows itself under one or other of the two forms described below.

1. Gangrenous Ergotism.—Various parts of the body, especially the extremities, suffer from imperfect blood-supply, owing to the contraction and thickening of the walls of the blood-vessels (*see* p. 391), thereby leading to a process of gangrene. It should not be mistaken for **pellagra**, a disease characterised by indolent ulcers on the skin, brought on by the use of diseased maize, or for **Raynaud's Disease**.

2. Spasmodic Ergotism.—In this variety, the patient first feels a sensation of itching, of tingling, and of insects crawling over the body, followed by a sensation of **numbness** and of **local anaesthesia**. These symptoms appear first in the hands and feet, then spread over the body. The sensory impairment is soon followed by signs of motor irritation, such as **tonic contraction** of the muscles, especially of the extremities; and later on by the development of a **staggering gait**. Vomiting and diarrhoea often accompany this variety, and dimness of sight, loss of hearing, and epileptiform convulsions are occasionally present.

It should not be confounded with **lathyrism**, palsy of the lower extremities caused by the use of chick-pea (*Lathyrus sativus* and *Lathyrus cicera*) as the only article of food.

THERAPEUTICS

Externally.—A hypodermic injection of ergotin has sometimes been found useful in curing **goitres** and **aneurisms** when injected into the parts around the sac. Ergotin 3 grs. injected every two or three days either into the sphincter or the prolapsed gut itself is said to cure **prolapse of the rectum**.

Internally.—As a *general hæmostatic* it has not entirely lost its reputation and is still largely used in internal hæmorrhages such as **epistaxis**, **hæmoptysis**, **hæmatemesis**, **hæmaturia**, &c. In urgent cases ergotin should be deeply or subcutaneously injected every fifteen to thirty minutes. The use of ergot in internal hæmorrhages is rather empirical, for it is very difficult to understand how a drug which causes constriction of the blood-vessels could stop internal hæmorrhage, as the constriction is more or less general in its distribution and attended with considerable rise of blood-pressure; but its action in uterine hæmorrhage is on a different footing, for if we remember the peculiar anatomical relations of the uterine sinuses we can understand that this depends not so much upon the constriction of arterioles as upon the tonic contraction of the uterine muscles, and therefore it is the most valuable remedy we have in **post-partum hæmorrhage**. In multiparæ who are often subject to this sort of bleeding, it is a wise plan to administer ergot just after the birth of the fœtus, or even before its birth if there be no contra-indication to its administration. In urgent cases the ammoniated tincture or the liquid extract may be given in 1 or 2 drs., or the official hypodermic injection in 10 m. doses very frequently. Good results have also been seen in **menorrhagia** and in **bleeding** from various forms of **uterine fibroids**. In fibroids, ergotin should be injected into the lip of the os.

On account of its *constricting effect* on the vessels, ergot has occasionally been employed in **purpura**, **dysentery**, **enlargement of the spleen**, **spinal sclerosis**, **excessive sweating**, **diabetes insipidus**, &c.

It is said to be useful in **obstinate chronic constipation** when combined with other purgatives. It acts probably by stimulating intestinal peristalsis.

As an *ecbolic*, ergot should be given with great caution. Its use should be confined to those cases of *uterine inertia* in which there is no *mechanical obstruction to the passage of the child*; otherwise the child's life may be endangered by the prolonged tonic contraction of the uterus, or if the resistance is too great it may cause rupture of that organ. Hence ergot should not be given *until after the expulsion of the placenta*, when it ensures firm contraction of the uterus and prevents post-partum hæmorrhage.

Prescribing hints.—Ergot is not a powerful poison. An ounce of the liquid extract has been given in one dose without toxic effects. The fresh infusion and the ammoniated preparations are the most reliable. The unpleasant taste of ergot is best covered by chloroform water, and tincture of orange. The inky mixture which results when the liquid extract is ordered with perchloride of iron can be clarified by the addition of a little citric acid. Ergotin may be given in pill (*see* p. 88) or capsule. The deep muscles of the buttock should be selected for hypodermic injection, but not the abdominal wall. The subcutaneous injection is often followed by inflammation and abscesses.

EUCALYPTI GUMMI

Eucalyptus Gum. N.O. *Myrtaceæ*

Syn.—Red Gum.

Habitat.—Australia. Cultivated in India, on the Nilgiris.

Source.—A ruby-coloured exudation, from the bark of *Eucalyptus rostrata* and some other species of *Eucalyptus*.

Characters.—In grains or small masses. Thin fragments are transparent ruby-red. Tough. Taste astringent. When chewed adheres to the teeth and tinges the saliva red. **Solubility.**—80 to 90 p.c. in cold water, entirely in alcohol (90 p.c.). **Impurity.**—Australian kino.

Identification.—It resembles kino, which is darker and feebly soluble in water.

Composition.—(1) *Kinolannic acid*. (2) *Catechin*. (3) *Pyrocatechin*.

Action.—A powerful astringent.

B.P. Dose.—2 to 5 grs.

OFFICIAL PREPARATION

1. **Trochiscus Eucalypti Gummi.**—1 gr. in each.

NON-OFFICIAL PREPARATIONS

1. **Decoc. Eucalypti Gummi.**—1 in 40. Boil till dissolved. As a gargle, and in *diarrhœa*. **Dose.**—2 to 4 drs.

2. **Ext. Eucalypti Gummi Liq. B.P.C.**—Gum 5 ozs., Alcohol (90 p.c.) 2 ozs., Water *q.s.* to 1 pint. **Dose.**— $\frac{1}{4}$ to 1 dr.

3. **Syr. Eucalypt. Gummi.**—Liquid extract 20, sugar 12. Dissolve. *Dose.*— $\frac{1}{2}$ to 1 dr.

4. **Insufflatio Eucalypti Gummi.**—Equal parts of Eucalyptus gum, in fine powder, and starch, for hæmorrhage and relaxed conditions of the larynx and trachea.

5. **Tinct. Eucalypti Gummi.**—1 in 4. *Dose.*—20 to 40 ms. Added to 7 parts of water, forms an astringent gargle.

6. **Trochisci Eucalypti Comp.**—Pot. Chloras 2, Cubeb powder $\frac{1}{4}$, Eucalyptus gum 1, with fruit paste as a basis, for relaxed throat.

PHARMACOLOGY AND THERAPEUTICS

Internally.—On account of the tannic acid it contains, eucalyptus gum is a true **astringent** like kino or catechu, but is more powerful as it adheres with pertinacity to the mucous membrane. Its decoction, tincture or liquid extract (1 in 7) may be used as a gargle for the cure of **spongy gums** and **relaxed sore throat**, or as a collunarium in **epistaxis**. The liquid extract mixed with water (1 in 10) makes a valuable lotion for injection into the vagina or rectum in **leucorrhœa** and **prolapse of the rectum**. The suppository (5 grs. in each) may be used in **piles**.

EUCALYPTI OLEUM

Oil of Eucalyptus

Source.—The oil distilled from the fresh leaves of *Eucalyptus globulus* and other species of *Eucalyptus*.

Characters.—Colourless or pale yellow. Odour aromatic, camphoraceous. Taste pungent, leaving a sensation of coldness in the mouth. Sp. gr. 0.910 to 0.930. *Solubility.*—3 in 1 of alcohol (90 p.c.).

Composition.—(1) *Eucalyptol*, a volatile oil 70 p.c., being a mixture of (a) a *Terpene* called *Phellandrene*; (b) *Cymene*. (2) A *Resin* (crystallizable) yielding ozone. (3) An oil, *Cincol*, isomeric with cajuputene hydrate. (4) *Tannin*.

Incompatibles.—Alkalis, mineral acids, metallic salts.

Action.—Powerfully antiseptic, deodorizer, antipyretic.

B.P. Dose.— $\frac{1}{2}$ to 3 ms.

OFFICIAL PREPARATION

1. **Unguentum Eucalypti.**—1 in 10.

NON-OFFICIAL PREPARATIONS

1. **Eucalyptus Dressings.**—Gauze 6 p.c. Wool and Lint 10 p.c.

2. **Eucalypteol.** *Syn.*—*Eucalyptene Hydrochloride*.—Crystalline, white, bitter, insoluble in water. In *phthisis* and *diarrhœa*. *Dose.*—2 to 6 grs.

3. **Eucalyptol.** *Syn.*—*Cincol*, *Cajuputol*.—Is that portion of the oil which passes over between 347° and 351°. It does not dry up like a varnished coating. Useful in *phthisis*, *asthma*, *diarrhœa*. *Dose.*—1 to 4 ms.

4. **Tr. Eucalypti (Foliorum), B.P.C.**—Leaves of *E. globulus* 4 ozs., Alcohol (90 p.c.) q.s. Percolate to 1 pint. *Dose.*—15 to 120 ms.

5. **Eucalypti Folia.**—The powdered leaves, in doses of 5 grs. and upwards, are much used in Italy for *malarial fevers*; also for smoking in cigarettes for the relief of *cardiac asthma*.

6. **Vapor Eucalypti, T.H.**—Oil 20 ms., Magnes. Carb. Levis 10 grs., water 1 oz. A teaspoonful in a pint of hot water.

7. **Sanosin.**—A proprietary preparation, in the form of a black powder, containing charcoal, sulphur, and eucalyptus oil. As an inhalation in *phthisis*.

PHARMACOLOGY

Externally.—Oil of eucalyptus is a **powerful antiseptic and disinfectant**. The old oil is more antiseptic than the new because it is more ozonized. Rubbed into the skin it is less irritant than other volatile oils, but if evaporation be prevented it causes **rubefaction** and **vesication**. It is destructive to the lower forms of life.

Internally. **Gastro-intestinal canal.**—In small doses it increases the **salivary and gastric secretions**, and thus acts as a **stomachic**. In large doses it produces gastro-intestinal irritation, with symptoms of vomiting, diarrhœa and colic.

Circulation.—Like quinine, it stops the amœboid movements and **diapedesis of the white blood-corpuscles** and contracts the **engorged spleen**. It possesses also **mild antiperiodic and antipyretic** properties. In small doses it stimulates the heart and raises the blood-pressure, perhaps reflexly through the stomach; and in excessively large doses the heart becomes weak and the blood-pressure and temperature fall.

Respiration is slightly stimulated by small doses, and is slowed by large ones. Death occurs from respiratory paralysis.

Nervous system.—Large doses depress the action of the brain, the medulla and the cord, thereby paralyzing the reflex action.

Elimination.—Like most of the volatile oils, it is eliminated by the kidneys, the skin, and the respiratory and the genito-urinary mucous membranes, all of which it stimulates in the course of its passage. Hence it is a **diuretic**, a **diaphoretic**, a stimulating **expectorant**, and a disinfecting stimulant to the genito-urinary tract. Like oil of turpentine it causes renal congestion, and imparts to the urine an odour like that of violets.

THERAPEUTICS

Externally.—Oil of eucalyptus, though a valuable antiseptic cannot be freely used on account of its local irritant property and cost. However, the ointment may be used for **foul ulcers and wounds**. The gauze, lint and wool are often used as antiseptic surgical dressings. Made into a pessary (15 ms. of oil in 1 dr. of cacao butter and 1 dr. of white wax), it has been found serviceable in **cancer of the uterus and rectum** and in checking fœtor and decomposition of the lochia; and into a bougie with iodoform (*see* Iodoform), in **urethral chancre and gonorrhœa**. An ointment of oil of eucalyptus 8, iodoform 1, hard paraffin 27, and soft paraffin 6, is considered a valuable remedy in **chancres**. Alone or mixed with mustard oil or olive oil, it may be rubbed into the skin in **chronic rheumatism and myalgia**. The

vapour has been used as an inhalation in **pulmonary gangrene**, **phthisis**, **chronic or foul bronchitis**, **ozæna**, &c. Many physicians now treat patients suffering from **exanthemata**, **whooping-cough** and **diphtheria** by enveloping them in an atmosphere of eucalyptus vapour. In **influenza** this plan of treatment is popularly adopted. The inunction is also recommended in **scarlet fever**. It may be used as a **parasiticide**.

Internally.—To correct **fœtor of the expectoration**, or to cut short an attack of **coryza**, of **influenza**, or of **catarrh**, it may be used with benefit. In septic fevers, such as **pyæmia** **septicæmia**, and **puerperal fever**, it has been found very efficacious in 5 m. doses. It may arrest **ague** and reduce **enlarged spleen**, but it is far inferior to quinine. As a stomachic carminative it has occasionally been prescribed in **dyspepsia**, especially if the stools are foul-smelling. A rectal injection of eucalyptol is considered to be an effective remedy in **thread-worm**. Oil of eucalyptus is a popular prophylactic against **influenza**.

Prescribing hints.—The oil is best given on sugar or mixed with honey, and the emulsion may be used as a urethral injection. Mixed with good English honey, it is sold in the Calcutta market under the name of "Eucalyptus Honey" as a remedy for colds and coughs of children.

EUONYMI CORTEX

Euonymus Bark. N.O. *Celastrineæ*

Syn.—Wahoo, Spindle-tree, and Hominy bush bark.

Habitat.—United States.

Source.—The dried root-bark of *Euonymus atropurpureus*.

Characters.—In quilled or curved pieces, $\frac{1}{2}$ to $\frac{1}{4}$ in. thick; outer layer ash-grey marked with darker patches; inner surface pale tawny white, smooth when free from fragments of white wood. Odour faint, characteristic. Taste mucilaginous at first, then bitter, acrid.

Composition.—(1) *Euonymin*, a resin. (2) *Asparagin*. (3) *Euonic acid*.

OFFICIAL PREPARATION

1. **Extractum Euonymi Siccum.** *Syn.*—*Euonymin*. **B.P.** Dose.—1 to 2 grs. in pill. (Should be kept in well-stoppered bottle.)

NON-OFFICIAL PREPARATIONS

1. **Tr. Euonymi, B.P.C.**—Bark 4, Alcohol (90 p.c.) q.s. to 20. Percolate. *Dose.*—10 to 40 ms.

2. **Extract. Euonymi Liquidum.**—Bark 1, Alcohol (90 p.c.) 4, water 1. *Dose.*—10 to 60 ms.

3. **Liq. Euonymini et Cascaræ, B.P.C.**—*Dose.*— $\frac{1}{2}$ to 1 dr.

4. **Liq. Euonymini et Iridini, B.P.C.**—Purgative and presumed cholagogue. *Dose.*— $\frac{1}{2}$ to 1 dr.

5. **Liq. Euonymini, B.P.C.**—*Dose.*—15 to 30 ms.

PHARMACOLOGY AND THERAPEUTICS

The action of euonymin resembles in many respects that of podophyllin, but is milder. In very small doses it stimulates the secretion of the gastric juice and in large doses it irritates the intestine. In medicinal doses it **increases the amount of bile and solids** secreted into the bowels. Hence it is a **cholagogue laxative**. It is said to have slight expectorant and diuretic properties. It is a very useful remedy in **hepatic disorders**, and in **constipation**, especially when it is due to torpidity of the liver. Combined with cascara, it may be given with very good results in **chronic or habitual constipation**.

Prescribing hints.—Euonymin may be given in pill or powder. The former is best massed with soap ($\frac{1}{2}$ gr. for a 2 or 3 gr. pill) if given alone. It is often prescribed with other cholagogues and laxatives as in the following formula:—Euonymin 1 $\frac{1}{2}$ grs., Podophyllin $\frac{1}{2}$ gr., Pulv. Ipecac. $\frac{1}{2}$ gr., Pil. Colocynth. et Hyos. 2 $\frac{1}{2}$ grs., Ext. Nucis Vom. $\frac{1}{2}$ gr. M. Ft. Pil. Mitte tales, 24. One pill at bed-time in obstinate constipation. The following powder is often prescribed by the writer with encouraging results in infantile hepatic enlargement with slow fever:—Ext. Euonymin Sic. $\frac{1}{2}$ gr., Pulv. Ipecac. $\frac{1}{2}$ gr., Pulv. Rhei 2 grs., Salicinum 1 gr., Sod. Bicarb. 2 grs. M. Ft. Pulv. Mitte tales 24, twice or thrice daily.

FEL BOVINUM PURIFICATUM

Purified Ox Bile. N.O. *Ruminantia*

Source.—Obtained by evaporating fresh ox bile to one quarter of its volume, shaking it with alcohol (90 p.c.), filtering and evaporating the residue to the consistence of a thick extract.

Characters.—Yellowish-green, hygroscopic. Taste partly sweet, partly bitter. **Solubility.**—In water, alcohol (90 p.c.).

Action.—Antiseptic, purgative. **B.P. Dose.**—5 to 15 grs. in pill.

PHARMACOLOGY AND THERAPEUTICS

Internally.—Ox bile helps the emulsification of fats, and is a **cholagogue purgative**. It may therefore be used in those cases of **dyspepsia** and **constipation** in which the natural secretion of bile is very deficient. 20 to 30 grs. dissolved in 1 or 2 ozs. of water may be given as a clyster in cases of **impaction of faeces in the rectum**, where there is no room for a larger enema. It is generally given in cachets or in solution, but it is best administered in the form of keratin-coated or salol-varnished pills, two hours after food.

FERRUM. Iron. Fe

Syn. I. V.—*Lohá*, Beng. Hind. *Louha*, Sans.

Source.—Annealed iron wire having a diameter of about 0.005 inch, or wrought iron nails free from oxide.

Iron salts naturally group themselves into two classes—Ferrous or Protosalts based upon Ferrous Oxide FeO , Ferric or Persalts (sesquisalts) upon Ferric Oxide Fe_2O_3 . Ferrous salts soon become ferric from the absorption of atmospheric oxygen, especially in the presence of oxidizing agents, as chlorine, nitric acid, &c.

OFFICIAL PREPARATION

1. **Vinum Ferri.** *Syn.*—*Steel Wine*.—1 oz. to 1 pint. Contains tartrates, citrates, and malates of iron. 3 fl. drs. are equal to 5 ms. of Tr. Ferri Perchlor. A mild hæmatinic tonic may be given with cod-liver oil to children. **B.P. Dose.**—1 to 4 drs.

NON-OFFICIAL PREPARATION

1. **Mistura Ferri Aromatica.** **B.P. 1885.** *Syn.*—*Heberden's Ink*.—Red Cinchona Bark 1 oz., Calumba $\frac{1}{2}$ oz., Cloves $\frac{1}{2}$ oz., Iron wire $\frac{1}{2}$ oz., Tr. Card. Co. 3 ozs., Tr. Aurantii $\frac{1}{2}$ oz., and Aqua Menth. Pip. 16 ozs. Macerate. An example of authorised chemical incompatibility. A stomachic tonic and hæmatinic. **Dose.**—1 to 2 ozs.

FERRUM REDACTUM

Reduced Iron. Fe and Fe_3O_4

Source.—A fine powder containing 75 p.c. of metallic iron, with a variable amount of iron oxide; prepared by reducing ferric hydroxide heated to redness, by a stream of dry hydrogen.

Characters.—A greyish-black powder, attracted by the magnet. *Impurity.*—Sulphur.

Action.—A non-astringent, hæmatinic, tonic.

B.P. Dose.—1 to 5 grs. in pill, powder, or lozenge.

OFFICIAL PREPARATION

1. **Trochiscus Ferri Redacti.**—1 gr. in each. **Dose.**—1 to 6.

FERRUM TARTARATUM

Tartarated Iron

Source.—Prepared like Ferri et Ammonii Citras with Acid Pot. Tartrate instead of Citric Acid.

Characters.—In thin, transparent, garnet-coloured scales. Taste somewhat sweetish, astringent. **Solubility.**—1 in 1 of water, freely in alcohol. **Impurities.**—Ferrous salts, ammonia.

Identification.—Its scales are smaller than those of Ferri et Ammonii Citras, being lighter in colour and not so sweet.

Action.—Hæmatinic, tonic, diuretic.

B.P. Dose.—5 to 10 grs. in mixture.

FERRI ARSENAS. Iron Arsenate

It consists of ferrous and ferric arsenates with some iron oxide.

Source.—Prepared by mixing hot solutions of sodium arsenate and ferrous sulphate, adding sodium bicarbonate in solution, and washing

and drying the precipitate. $3\text{FeSO}_4 + 2\text{Na}_2\text{HAsO}_4 + 2\text{NaHCO}_3 = \text{Fe}_3(\text{AsO}_4)_2 + 3\text{Na}_2\text{SO}_4 + 4\text{H}_2\text{O} + 2\text{CO}_2$.

Characters.—A tasteless (not to be tasted) greenish, amorphous powder; insoluble in water. **Impurities.**—Sulphates, &c.

Antidotes.—The same as those of Acidum Arseniosum (*see* p. 174).

Action.—Like arsenic. Useful in skin and liver diseases with gouty, rheumatic, or malarial taint, also in chronic malarial fevers.

B.P. Dose.— $\frac{1}{10}$ to $\frac{1}{4}$ gr. in pill.

FERRI CARBONAS SACCHARATUS

Saccharated Iron Carbonate

A ferrous oxycarbonate, $x\text{FeCO}_3 \cdot y\text{Fe}(\text{OH})_2$, more or less oxidized, mixed with sugar; the ferrous salt if reckoned as carbonate, FeCO_3 , forming about one-third of the mixture.

Source.—Prepared by precipitating fresh iron carbonate by mixing solutions of ammonium carbonate and ferrous sulphate; and washing and rubbing it with sugar. Sugar prevents further oxidation.

Characters.—A greyish-brown, lumpy powder with a sweet chalybeate taste. **Impurities.**—Sulphates, excess of iron oxide.

Identification.—The greyish-brown colour, the lumpy nature; the sweet chalybeate taste and the absence of odour help recognition.

Incompatibles.—Vegetable astringents, acids, and acid salts.

Action.—An easily borne non-astringent chalybeate.

B.P. Dose.—10 to 30 grs. in cachets, powders, lozenges, or pills.

OFFICIAL PREPARATION

1. **Mistura Ferri Composita.** *Syn.*—*Griffith's Mixture* (modified).— $2\frac{1}{2}$ grs. in 1 oz. A valuable preparation for *amenorrhœa* from *anæmia*. **B.P. Dose.**— $\frac{1}{2}$ to 1 oz.

Dispensing hints.—The mixture may be prepared and kept without iron sulphate which ($2\frac{1}{2}$ grs. per oz.) may be added when dispensed.

NON-OFFICIAL PREPARATIONS

1. **Pilula Ferri Carbonatis.** *Syn.*—*Vallet's Mass.*—A freshly precipitated iron carbonate made into a pill with honey and sugar.

2. **Troch. Ferri Carb. Sacch.**—3 grs. in each. Largely used nowadays. *Dose.*—1 to 3.

FERRI ET AMMONII CITRAS

Iron and Ammonium Citrate

Source.—Prepared by mixing dilute solutions of ammonia and ferric sulphate, dissolving the resulting ferric hydroxide in hot solution of citric acid, neutralizing the product with ammonia, evaporating and drying in thin layers on glass sheets.

Characters.—In deep red, transparent, thin scales. Taste slightly astringent. **Solubility.**—2 in 1 of water. **Impurities.**—Tartrates, sulphates.

Identification.—It resembles Ferrum Tartaratum, but is darker, less shining, sweeter, and is found in larger scales.

Incompatibles.—Mineral acids, fixed alkalis and vegetable astringents.

Action.—An almost non-astringent chalybeate, easily borne by the stomach when given in an effervescing form; the iron salt being put in the acid solution.

B.P. Dose.—5 to 10 grs.

OFFICIAL PREPARATION

1. **Vinum Ferri Citratis.**—8 grs. in 1 oz. **B.P. Dose.**—1 to 4 drs.

FERRI ET QUININÆ CITRAS

Iron and Quinine Citrate

Source.—Prepared like *Ferri et Ammonii Citras*, freshly precipitated quinine being also dissolved in the solution of citric acid.

Characters.—In greenish golden-yellow somewhat deliquescent thin scales. Taste bitter. *Solubility.*—2 in 1. of water. *Impurities.*—Alkaline salts and other alkaloids instead of quinine.

Identification.—The golden-yellow colour, the bitter taste, and the deliquescent nature distinguish it from other scale preparations. Note the characteristics of the three scale compounds.

Incompatibles.—Alkalis and their carbonates, tannin, vegetable astringents, potassium citrate.

Action.—Hæmatinic, tonic, antiperiodic.

B.P. Dose.—5 to 10 grs. in pill or mixture.

FERRI PHOSPHAS. Iron Phosphate

A powder containing not less than 47 p.c. of hydrous ferrous phosphate $\text{Fe}_2(\text{PO}_4)_2 \cdot 8\text{H}_2\text{O}$, with ferric phosphate and some iron oxide.

Source.—Prepared like *Ferri Arsenas* by substituting sodium phosphate for sodium arsenate (see p. 398).

Characters.—A slate-blue amorphous powder, insoluble in water. *Impurity.*—Arsenic.

Action.—A nervine tonic.

B.P. Dose.—5 to 10 grs. in cachets, pills or powders.

OFFICIAL PREPARATIONS

1. **Syrupus Ferri Phosphatis.**—1 gr. of anhydrous ferrous phosphate in 1 dr. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.

Dispensing hints.—This may be conveniently made by mixing *Liq. Ferri Phosph.* Fort. 1. Si. Syrup 5 $\frac{1}{2}$, Distilled Water 1 $\frac{1}{2}$. A small excess of the solution is necessary to prevent the loss from oxidation. The syrup is to be kept in small bottles lying down.

2. **Syrupus Ferri Phosphatis cum Quinina et Strychnina.** *Syn.*—*Easton's Syrup* (modified).—1 gr. Anhydrous Ferrous Phosphate, $\frac{1}{2}$ gr. Quinine Sulphate, $\frac{1}{15}$ gr. Strychnine in 1 fl. dr. An excellent general and nervine tonic. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr. (It becomes discoloured.)

Dispensing hints.—This syrup may be made on the counter thus:—Strychnine 10 grs., Quinine Sulphate 260 grs., Concentrated Phosphoric Acid 2 drs., Distilled Water *q.s.* to 5 ozs. Mix and keep ready. When required 1 part to 7 parts of Syrup. *Ferri Phosphatis*.

NON-OFFICIAL PREPARATIONS

1. **Liquor Ferri Phosphatis Fortis.**—8 grs. in 1 dr. Iron wire 360 grs., Concentrated Phosphoric Acid 6 ozs., Distilled Water *q.s.* to 12 ozs. Dissolve.

2. **Pilula Ferri Quininae et Strychninae Phosphatum.** *Syn.*—*Easton's Pill.*—An equivalent for *Easton's Syrup*. Ferrous Phosphate 16 grs., Quinine Sulphate 16 grs., Strychnine $\frac{1}{2}$ gr., Milk Sugar 20 grs., Concentrated Phosphoric Acid *q.s.* Mix quickly, first having triturated strychnine with milk sugar, and divide into 16 pills.

3. **Syrupus Ferri et Manganis Phosphatum.**—Prepared by dissolving Manganese Phosphate $\frac{1}{2}$ gr. in 1 dr. of official Syrupus Ferri Phosphatis.

4. **Syrupus Ferri Phosphatis Compositus, B.P.C.** *Syn.*—*Chemical Food, Parrish's Syrup* (modified).—Iron Phosphate $\frac{1}{2}$ gr., Calcium Phosphate $\frac{1}{2}$ gr. in 1 dr. Iron Wire free from oxide $37\frac{1}{2}$ grs., Concentrated Phosphoric Acid (sp. gr. 1.5) 1 oz., Distilled Water 5 drs., put all in flask plugged with cotton and dissolve by gentle heat, iron being under the liquid. Add this to the following when the latter has cooled:—

Precipitated Calcium Carbonate 120 grs., Concentrated Phosphoric Acid 4 drs., Distilled Water 2 ozs.; mix and add Potassium Bicarbonate 9 grs., Sodium Phosphate 9 grs., filter, and set aside.

Cochineal 30 grs., Distilled Water $7\frac{1}{2}$ ozs., boil for 15 minutes and filter, pouring over the filter water *q.s.* to make 7 fl. oz. of filtrate; to this add refined sugar 14 ozs. and heat till dissolved and strain. When cold add the former filtrate set aside, and Distilled Water *q.s.* to 20 ozs. It should be kept in bottles quite full. *Dose.*— $\frac{1}{4}$ to 2 drs.

5. **Glyc. Ferri, Quininae et Strychninae Phosphatum, U.S.**—*Syn.*—*Glycerole-Easton.*—As a substitute for *Easton's Syrup* where sugar is not desirable. *Dose.*—15 ms.

FERRI SULPHAS

Ferrous Sulphate. $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$

Syn. I V.—*Hirekas*, Beng. *Hira Kasas*, Hind.

Source.—Prepared by the interaction of diluted sulphuric acid and iron.

Characters.—In oblique, rhombic prisms, of a pale greenish-blue colour and astringent taste. *Solubility.*—1 in $1\frac{1}{2}$ of water. *Impurities.*—Persalts and other metals.

Identification.—Easy, as no other salt of B.P. resembles it. When exposed it effloresces, becoming coated with a reddish-brown crust.

Action.—Astringent, hæmatinic, tonic, and π *menagogue*. An adjunct to purgatives. Externally astringent and sty γ B. Its lotion (10 grs. to 1 oz.) is very useful in *crispelas*.

B.P. Dose.—1 to 5 grs. in pill (*see* p. 88).

OFFICIAL PREPARATIONS

1. **Ferri Sulphas Exsiccatus.**— $2\frac{1}{2}$ grs. equal to 4 grs. of Ferri Sulphas. A nearly white powder made by heating Ferri Sulph. at 212° F. till it loses 40 p.c. of its weight; and powdering it fine. *Enters into.*—Pil. Aloes et Ferri. **B.P. Dose.**— $\frac{1}{2}$ to 3 grs., in pill (*see* p. 88).

2. **Liquor Ferri Persulphatis.**— $36\frac{1}{2}$ p.c. Prepared by dissolving 8 ozs. of ferrous sulphate in 6 drs. of Sulphuric Acid diluted with 10 ozs. of water

and adding the same to Nitric Acid 6 drs. diluted with 2 ozs. of water, and making up 11 ozs. after converting the sulphate into persulphate by boiling. **Action.**—Styptic. *Enters into.*—The preparation of Ferri et Ammonii Citras, Ferri et Quininae Citras, Ferrum Tartarum and Liq. Ferri Acetatis.

3. **Pilula Ferri.** *Syn.*—*Blaud's Pill.*—1 Ferrous Carbonate in 5 Ferri Sulph. changes into carbonate. Both ferrous sulphate and sodium carbonate should be perfectly dry. An excellent hæmatinic tonic and emmenagogue, generally used in amenorrhœa. **B.P. Dose.**—5 to 15 grs.

4. **Pilula Aloes et Ferri.**—1 in 9. **B.P. Dose.**—4 to 8 grs.

NON-OFFICIAL PREPARATION

1. **Liquor Ferri Sub-sulphatis.** **U.S.** *Syn.*—*Monell's Solution.*—Strong styptic and least irritating. **Dose.**—3 to 6 ms.

LIQUOR FERRI ACETATIS

Solution of Ferric Acetate

Source and Characters.—A sour, red liquid prepared by dissolving ferric hydrate, formed by precipitating solution of ferric sulphate with ammonia, in glacial acetic acid and water.

Action.—Hæmatinic, astringent, diuretic. Can be given with Potassium Acetate in *Bright's disease*. **B.P. Dose.**—5 to 15 ms., in mixture.

NON-OFFICIAL PREPARATION

1. **Liq. Ferri et Ammonii Acetatis.** **U.S.** *Syn.*—*Busham's Mixture.*—Tr. Ferri Perchloridi 4, Acid. Acetic. dil. 6, Liq. Ammon. Acetatis 50, Elix. Aurantii 12, Glycerin 12, Water to 100. Mix the solution of acetate of ammonia with acid, add tincture, then the rest, and mix. **Dose.**—1 to 4 drs.

LIQUOR FERRI PERCHLORIDI FORTIS

Strong Solution of Ferric Chloride

Source.—Prepared by boiling iron wire in hydrochloric acid and water, and after filtering, adding nitric acid and more hydrochloric acid, and evaporating.

Characters.—An orange-brown solution, miscible with water and alcohol. **Impurities.**—Ferrous Salts and other metals. 110 ms. contain 22½ grs. of iron.

Action.—Caustic, hæm^{st.}atic, powerful astringent.

OFFICIAL PREPARATIONS

1. **Liquor Ferri Perchloridi.**—1 in 4. **B.P. Dose.**—5 to 15 ms. diluted freely.

2. **Tinctura Ferri Perchloridi.** *Syn.*—*Steel Drops.*—1 in 4. **B.P. Dose.**—5 to 15 ms. diluted freely.

NON-OFFICIAL PREPARATIONS

1. **Liquor Ferri Chloroxydi.**—A non-irritant and non-astringent hæmatinic. **Dose.**—10 to 30 ms.

2. **Liquor Ferri Dialysatus, B.P. 1885.**—Contains 5 p.c. of ferric oxide. A useful antidote to arsenic. A non-irritating tasteless hæmatinic, largely prescribed. It is in reality a colloid or undialysed iron, which does not pass through the septum; hence doubts are entertained as to its assimilation. But it is certain that patients improve under its use. *Dose.*—10 to 30 ms.

LIQUOR FERRI PERNITRATIS

Solution of Ferric Nitrate

Source and Characters.—An acid reddish-brown liquid, prepared by dissolving iron wire in nitric acid and water. 110 ms. contain 3·3 grs. of iron. *Impurities.*—Ferrous salts, chlorides, and sulphates.

B.P. Dose.—5 to 15 ms.

SYRUPUS FERRI IODIDI

Syrup of Ferrous Iodide, 1 gr. in 11 ms.

This is liable to discoloration either from the oxidation of iron, which may be removed by careful manipulation or by hypophosphorous acid; or from slight caramelisation of sugar by overheating. Very useful in *sypphilis* and *scrofula*.

B.P. Dose.— $\frac{1}{2}$ to 1 dr., 2 ms. for a child one year old.

NON-OFFICIAL PREPARATIONS OF IODIDE OF IRON

1. **Liq. Ferri Iodidi.**—Prepared by combining iron wire 1 oz., iodine 2 ozs., in water 2 ozs., by gentle heat until all the iodine is combined. Decant and add concentrated hypophosphorous acid 1 dr., filter and add water to 4 ozs. 1 vol. to 7 vols. of thick syrup makes Syrupus Ferri Iodidi B.P. It keeps well in a corked bottle with a small quantity of hypophosphorous acid, or a coil of bright iron wire immersed in it.

2. **Pilula Ferri Iodidi. B.P. 1885.**—*Dose.*—3 to 8 grs.

ADDITIONAL NON-OFFICIAL PREPARATIONS AND DERIVATIVES OF IRON

1. **Ferri Albuminas.**—A scale preparation fairly soluble in water, containing 5 p.c. of ferric oxide. Useful in *anæmia* and *gastric ulcer*. Striking results from the hypodermic injection of 10 to 20 ms. of aqueous solution. *Dose.*—3 to 10 grs.

2. **Ferratin.**—A tasteless brown powder prepared from egg albumen and Ferri et Sod. Tartras, containing iron 7 p.c. The most easily assimilable preparation known. *Dose.*—10 to 30 grs. per diem.

3. **Triferrin. Syn. — Ferri Nucleinas.**—A brownish-yellow powder insoluble in water, contains 21 p.c. of iron and about 3 p.c. of phosphorus. *Dose.*—15 grs. per diem, in divided doses.

4. **Ferri Lactas.**—A greenish soluble powder. *Dose.*—2 to 10 grs.

5. **Carniferrin.**—A compound of phospho-carnic acid of muscle and iron. A tasteless brown powder easily assimilated. *Dose.*—8 grs. daily.

6. **Ferro Somatose.**—A tasteless soluble brown powder containing albumose of meat (somatose) and ferric oxide 4·5 p.c. Easily assimilable in *anæmia* and *chlorosis*. *Dose.*—75 to 150 grs. daily. **Iron tropon** is a similar compound with nutrient tropon. *Dose.*—1 dr. thrice daily.

7. **Ferri Succinas.**—A reddish-brown insoluble powder. Useful in *biliary calculi*, with chloroform. *Dose.*—1 dr. with chloroform 10 ms.; 4 to 6 times daily after food.

8. **Ferri Bromidum.**—*Dose.*—3 to 10 grs.

9. **Syrupus Ferri Bromidi.** B.P.C.— $4\frac{1}{2}$ grs. Ferrous Bromide in 1 dr. Prepared by agitating iron wire free from oxide $\frac{1}{2}$ oz., with Bromine 525 grs. and Water 4 ozs., and filtering solution into warm syrup made by mixing Sugar 14 ozs. and Water 6 ozs., add water *q.s.* to 1 pt. *Dose.*— $\frac{1}{2}$ to 1 dr.

10. **Syrupus Ferri Bromidi cum Quinina.** B.P.C.—1 gr. of Quin. Acid. Hydrobrom. and 4 grs. of Ferrous Brom. in 1 dr. Prepared by dissolving Quinin. Acid. Hydrobrom. 2, in Water 8, Acid. Hydrobrom. dil. 2, and adding Syr. Ferri Bromidi to 100. *Dose.*— $\frac{1}{2}$ to 1 dr.

11. **Syr. Ferri Brom. c. Quin. et Strych.** B.P.C.—Prepared as above with the addition of $\frac{1}{8}$ gr. of Strychnine in 1 dr. *Dose.*— $\frac{1}{2}$ to 1 dr. diluted.

12. **Ferri Hypophosphis.** U.S.—Freshly made salt is greenish, crystalline, soluble in water, commercial salt is insoluble. *Dose.*—1 to 5 grs. in pill.

13. **Liquor Ferri Hypophosphitis Fortis.** B.P.C.—5 grs. of Ferrous Hypophos. in 1 dr. *Dose.*—10 to 30 ms.

14. **Liquor Hypophosphitum Compositus.** B.P.C. *Syn.*—*Liquor Ferri Hypophosphitis Comp.*—2 grs. each of Sodium and Calcium Hypophosphite, 1 gr. of Magnesium Hypophosphite, and $1\frac{1}{2}$ grs. Ferric Hypophosphite in 1 dr. *Dose.*— $\frac{1}{2}$ to 2 drs.

15. **Syrup. Ferri Hypophosphitis.** B.P.C.—Ferri Hypophosphitis Fortis 1, syrup to 5. *Dose.*— $\frac{1}{2}$ to 2 drs.

16. **Syrup. Hypophosphitum Compositus.** B.P.C.— $\frac{1}{10}$ of Strychnine in 1 dr., Strychnine 0.012, Hypophosphorous Acid 0.625. Dissolve, and add it to the following solution:—Calcium Hypophosphite 1.0, Manganese 0.5, Potassium 0.5, Quinine 0.25, Chloroform Water 40. Add strong solution of Ferric Hypophosphite 5, Sugar 70, dissolve without heat, and add Chloroform Water *q.s.* to 100. This is intended to be a substitute for **Fellow's Compound Syrup of the Hypophosphites.** *Dose.*— $\frac{1}{2}$ to 2 drs.

17. **Liquor Ferri Peptonati.** B.P.C.—A solution of peptonated iron. *Dose.*—1 to 4 drs.

18. **Ferri Fluoridum.**—A purplish-white insoluble powder. In *enlarged spleen* or other *enlarged glands.* *Dose.*— $\frac{1}{16}$ to $\frac{1}{2}$ gr.

19. **Ferro - Alumen.** *Syn.*—*Ferric Ammonium Sulphate.* U.S.—Amethyst-coloured crystals. Soluble 1 in 3 in water. In internal hæmorrhages, also used as a spray, gargle, or pigment. *Dose.*—3 to 10 grs.

PHARMACOLOGY OF IRON AND ITS SALTS

Externally.—Iron salts have no action on the unbroken skin, and are not absorbed by it. **Ferrous** and **organic salts** are **feebly astringent**. A solution of ferric salt when applied to a denuded surface, mucous membrane, sores or ulcers, **coagulates** the **albuminous secretion**, as well as the **albumen** of the tissues. It also **coagulates blood and plasma**. Thus, the circulation of the part is greatly reduced by the compression of the coagulated albumen from outside and not by the contraction of the muscular fibres of the walls of the blood-vessels. If there is any **hæmorrhage**, it is readily arrested by (1) the compression of the blood-vessels from without, and (2) the

plugging of the bleeding vessels by the clotting of the blood within them. Therefore it is a powerful **styptic**. The perchloride, the pernitrate and the persulphate of iron are all strong **local astringents**. The oxides of iron convert oxygen into ozone and are therefore **disinfectant**.

Internally. **Mouth.**—Iron **blackens** the **teeth** and the **tongue**, from the deposition of iron sulphide. The sulphur is derived from the food and tartar on the teeth. It has a styptic taste, and the ferric salts have a similar action here as on the raw skin.

Stomach.—All iron preparations, in whatever form they are taken by the mouth, are mostly **converted** into **ferric chloride** in the stomach, and not into an albuminate as has been generally supposed. Even an albuminate is decomposed into a chloride. If given in excess, or if the food or the gastric juice is deficient, all iron salts (except the ferric chloride) will abstract the hydrochloric acid from the gastric juice, and impair digestion. On the other hand, strong acid salts set free an excess of acid, after the formation of the ferric chloride which acts as an **irritant** to the mucous membrane. Even the preparations of perchloride do this as they contain a large amount of free acid. The astringent effect of iron salts depends no doubt upon the amount of ferric chloride formed in the stomach.

Intestines.—Here too the iron salts undergo decomposition. The ferric chloride coming in contact with the alkaline fluid becomes an oxide of iron, which remains dissolved in the intestinal fluid because of the presence of organic matters. The subchloride becomes the ferrous carbonate which is also soluble. Lower down they are again converted into sulphides and tannates by the sulphuretted hydrogen and tannic acid, this being derived from the vegetable food, and are passed out with the feces, which are coloured black. Experience has shown that iron produces **constipation**, particularly if the astringent preparations are given; but it is not known whether this is due to its direct or remote action. It is also a clinical fact that it occasionally causes **diarrhoea**. Doubts are entertained as to whether the iron salts are absorbed by the intestines, but from the following it will be evident that they are.

Absorption.—There is a consensus of opinion that **organic compounds of iron** are absorbed by the gastro-intestinal canal, for the growing child derives all the iron necessary for its increasing growth and weight from its food. But opinions widely differ as to the absorption of inorganic compounds of iron. Indeed one school holds that inorganic preparations are not taken up by the gastro-intestinal tract. Buchheim's view is that inorganic compounds of iron are not absorbed but exert their beneficial effect in *anæmia* by a stimulating action on the gastro-intestinal mucous membrane, whereby appetite and digestion are improved, and the extra food taken supplies the necessary iron to reconstitute the blood.

Bunge's theory is somewhat similar. He holds that inorganic iron

cannot be absorbed, and that iron only in organic combination, as found in foodstuffs, can be utilised for the formation of hæmoglobin. He says that, in anæmia, digestion is greatly disturbed, and that alkaline sulphides are produced, which combine with the organic iron in the food, producing Fe_2S_3 , which is an inorganic salt and therefore incapable of absorption. He argues that when iron is given in this condition, it combines with, and neutralizes, the alkaline sulphides thus protecting the organic iron of the foodstuffs and allowing it to be absorbed. The chief argument in support of these views is that when iron salts are given by the mouth they do not cause excretion of more iron in the urine or the bile. But it has been shown that the absence of iron from the urine and the bile is fully accounted for by its retention in the liver and subsequent excretion through the intestinal mucous membrane. Moreover it has been proved that mere stimulation of the intestinal mucous membrane by other tonics does not cure anæmia, and Stockman has shown (a) that sulphide of iron, which cannot absorb alkaline sulphides, will cure chlorosis, (b) that bismuth which can neutralize more sulphides than iron, is quite useless for this purpose. The views of Bunge and Buchheim may therefore be rejected, and the modern view founded on histological evidence is that iron salts are **absorbed by the intestinal epithelium** and transferred to the white corpuscles of the blood, which convey them to the liver where they are deposited and gradually elaborated into more or less complex organic substances one of which is certainly Ferratin. These organic compounds then slowly pass into the general blood-stream, and are utilized by the great blood-forming organs, *viz.*, the spleen, the lymphatic glands and the red bone marrow.

Blood.—In health iron has very little effect upon either the quantity or the quality of the blood-corpuscles, but in some forms of anæmia both the number of corpuscles and their hæmoglobin value are markedly increased. In cases of this kind it is probable that iron acts in the following way :—(1) The functional activity of the blood-forming organs, which is lowered or suppressed in anæmia, requires a stimulus or impulse. (2) Iron, when carried in the circulation to these organs, acts as a *chemical stimulus*, and not being an entirely foreign constituent is less injurious in its action than other stimulants. Hence iron is a splendid **hæmatinic**. As the quantity of iron in the blood of an ordinary healthy female is about 38 grains, we could, if the absorption of iron was great, cure chlorosis in one day's treatment; but such is not the case. The absorption is too slow and the process by which it is elaborated is too complex.

Metabolism.—With the improvement of the red blood-corpuscles in anæmia, there is necessarily an increased absorption of oxygen, and an increased oxidation of tissues. Hence, the functional activity of all the organs of the body is stimulated, leading to the general improvement and the tone of the body. Iron is therefore a most valuable **general tonic**. As the whole system shares in this benefit, the

menstrual flow, if it had been stopped, is re-established, and many disordered functions are rectified.

Kidneys and bladder.—Iron salts are feebly excreted by the renal cells. One milligramme is eliminated daily, and this seems to remain almost constant in all circumstances. The ferric salts slightly diminish the secretion of urine, while the other preparations have no effect, except the tartrate and the acetate, which slightly increase it. They may sometimes **irritate the bladder**, and may cause **nocturnal incontinence** of the urine in children.

Elimination.—Opinions vary. Some say that iron is excreted in the urine, sweat, saliva, milk, bile and pancreatic juice, and by the intestinal mucous membrane; while others, in the urine and bile only. However, this is a fact that much is eliminated by the gastro-intestinal mucous membrane, as the amount in the urine and the bile is almost constant. A small portion of it is stored up in the spleen, the marrow and the lymphatic glands, but the most goes to the liver, where it is used up in forming complex compounds (one of which is ferratin), as the precursors of hæmoglobin. The red marrow also has a share in the production of red blood-corpuscles.

THERAPEUTICS OF IRON AND ITS SALTS

Externally.—Organic iron salts and ferrous salts except ferrous sulphate are not locally used. The strong solution of ferric chloride may be used as a caustic to destroy **polypus** of the nose, **warts**, &c. Its solution (1 in 4) or the Liq. Ferri Perchloridi may be used as a local hæmostatic in **leech bites**, and in **bleeding** after the extraction of a tooth. It is the most efficient last resource when injected into the uterus in **post-partum hæmorrhages**. The lint or cotton-wool soaked in the solution may be introduced into the cavity of the nose, rectum or uterus in hæmorrhage from these parts. The solution or the tincture of perchloride mixed with equal quantity of glycerin makes an excellent paint on **enlarged tonsils**, **diphtheria** and **sore throat**. The same may be used as a gargle well diluted. A solution of ferrous sulphate (10 grs. to 1 oz. of water) is an extremely useful local application in **erysipelas** and **erythema**, but it deserves to be noted that its stain on the linen is not removed by washing. Sometimes the tincture of perchloride may be painted for the same purpose. A solution of sulphate (1 gr. in 1 oz.) has sometimes been found effective in **gleet**.

Internally. Gastro-intestinal tract.—As a rule the organic preparations are more easily assimilable than the inorganic. In severe hæmorrhage from the stomach or bowels, as from **ulcers**, innocent or malignant, or **cirrhosis** of the **liver**, the solution or tincture of perchloride is an excellent remedy for arresting it. It may be given in drachm doses every one or two hours with glycerin. The constipating effect of iron is overcome by the addition of a purgative. **Chronic**

diarrhoea, rebellious to all manner of treatment, is sometimes wonderfully checked by the solution of pernitrate. **Chronic constipation** may often be successfully removed by ferrous sulphate and extract of nux vomica or extract of belladonna. Humid peroxide of iron is an antidote to **arsenical poisoning**. It can be prepared fresh by mixing a solution of perchloride 3 ozs., with bicarbonate of soda 1 oz., in solution, half an ounce being given every 5 or 10 minutes. Liq. Ferri Dialysati may be given in its stead in $\frac{1}{2}$ or 1 oz. doses diluted. An enema of the tincture of perchloride of iron (1 dr. in $\frac{1}{2}$ pint of water) kills **thread-worms**.

Blood.—As a hæmatinic tonic, iron salts stand on a high level, and are used in endless ailments, such as **anæmia**, **chlorosis**, **scrofula**, **cardiac diseases**, **syphilis**, **Bright's disease**, **amenorrhœa**, **malarial cachexia**, **convalescence** from acute or chronic illness, &c. A few of them require more than a passing notice.

Anæmia and **Chlorosis**.—Ordinary forms of anæmia traceable to some definite cause, such as **scurvy**, **malaria**, **protracted discharges** or **recurrent passive hæmorrhage**, **lead poisoning**, **ankylostomiasis**, &c., are materially benefited by a course of iron, as well as by the removal of the cause, if possible. Iron is the most valuable medicine in chlorosis of young females. Pilula ferri, ferrous sulphate and ferric perchloride are the preparations generally selected. Striking results were obtained by Stockman in chlorosis by the subcutaneous injection of ammonio-citrate in small doses. If the anæmia is due to malaria, Ferri et Quinæ Citras, Easton's Syrup or pill may be given with advantage. The same preparations may as well be employed as a tonic during convalescence after an acute febrile attack or any other protracted illness. Iron, particularly the perchloride, is very useful in **recurrent passive hæmorrhage** from the nose, uterus or respiratory tract, or in **discharge** from the same or allied parts, as **leucorrhœa**. The writer once stopped a persistent bleeding from the uterus, caused by a prolonged use of aloes as a purgative for obstinate constipation, when every other hæmostatic failed. Iron often removes that form of **neuralgic pain** or **insomnia** which sometimes accompany anæmia. Iron is quite useless in the treatment of **pernicious anæmia**, and its value is doubted in the anæmia of **leucocythæmia**, **Hodgkin's disease** and **exophthalmic goitre**.

Bright's disease.—Acetate of iron is the most valuable remedy in this disease. It not only removes the anæmia, but lessens or removes the albumen. 10 to 20 ms. of the tincture with half an ounce of the solution of acetate of ammonia, or with potassium acetate, or with both, form an exceedingly useful preparation in **chronic albuminuria**. With many the steel drops is a favourite remedy.

Amenorrhœa due to anæmia often yields to iron especially when given with potassium carbonate or aloes, as for example, Blaud's pill, Pil. Aloes et Ferri and Mist. Ferri Comp. with equal part of decoction of aloes.

Syphilis, lupus, scrofula, and other tubercular affections, as also *chronic rheumatoid arthritis*, are benefited by a course of iodide of iron. The syrup of the iodide is ordinarily prescribed in these cases.

Many obscure symptoms dependent on anæmia, such as dyspepsia, headache, vertigo are relieved by a course of iron. Lately the writer has given *Tr. ferri perchloridi* an extended trial in chronic **diabetes**, and is pleased to record that patients improved under its use. The bowels and the digestive functions had to be kept in order.

Erysipelas, diphtheria and many forms of bad sore throat, such as **hospital sore throat**, are remarkably benefited by large doses (15 to 30 ms.) of *Tr. ferri perchloridi* given every one or two hours. Many yet recommend steel drops in **puerperal fever**. But the tendency of the present day is to ignore the value of this tried drug.

Nervous system.—Iron cannot directly influence the nervous system, but indirectly it does by improving the nutrition and the general functions of the bodily organs. It has been found efficacious in **chorea, hysteria, neurasthenia**, and in many nervous and subjective symptoms commonly associated with the climacteric period. Easton's syrup or pill. *Syr. Hypophosph. Comp.*, *Syr. Ferri Hypophosph.*, or *Syr. Ferri Brom. c. quin.* may be selected with advantage.

Caution.—The following points should always be remembered during the administration of iron :—

1. Iron sometimes irritates the stomach even of healthy persons.
2. Never give iron to a patient with a "dirty" tongue. Cure the dyspepsia first, and then administer iron.
3. Begin with one of the milder preparations and give it after meals.
4. Use it very cautiously in plethoric subjects, or in those who are predisposed to apoplexy.
5. Change your preparation from time to time during a long course of iron treatment or stop it at intervals.
6. If iron causes constipation, combine it with purgatives.
7. If iron causes headache or indigestion, stop it at once.
8. Iron should never be given to a patient who is suffering from fever.

Prescribing hints.—The choice of a preparation sometimes becomes difficult to a young practitioner. He should distinguish an astringent from a non-astringent preparation, and bear in mind that there are a few, such as iodide, arsenate, phosphate, and citrate with quinine, whose value depends, mainly or to some extent upon the other ingredients they contain. The organic salts are non-astringent. Of the inorganic salts, the ferrous salts are less astringent than the ferric salts. These salts may be given in powder, pill, mixture or hypodermically. The perchloride is largely employed in various ways, as a gargle, pigment, spray, dressing (*e.g.* cotton or lint soaked in solution 15 p.c.), rectal, uterine or urethral injection or mixture. If given in a mixture, glycerin or lemon juice pretty well covers the ferruginous taste. The infusion of quassia, calumba or chiretta may be used as a vehicle as they do not contain tannin. The constipating

property of iron salts is best removed by Mag. Sulph. if given in a mixture or by aloes or rhubarb if in pill. The inky colour which results if they are combined with cinchona or digitalis, is cleared by the addition of a few drops of diluted phosphoric acid. The action of iron is not affected by this chemical change. Blaud's pill and Griffith's mixture are exceedingly good preparations in anæmia, as they contain alkaline carbonates which tend also to form red blood-corpuscles. Syr. Ferri Phosph. and Syr. Ferri Iodidi should be given alone diluted. Ferrous sulphate is given in pill (*see* p. 88), and if it is intended for action on the intestine it should be coated with keratin. To prevent the blackening of the teeth, the iron mixture should be swallowed through a glass tube or a quill. Ferri et Ammonii Citras may be given hypodermically (5 p.c. solution), or in mixture in an effervescing form; care being taken to put the iron into the acid solution. Parrish's chemical food is an excellent preparation for children and delicate females. Citrate of iron and quinine should not be mixed with alkalis or alkaline carbonates as the quinine is precipitated.

FICUS. Figs

N.O. *Urticaceæ*

Habitat.—Smyrna.

Source.—The dried fleshy receptacles of *Ficus carica*.

Characters.—Consists of the enlarged hollow succulent receptacle bearing numerous achenes on its inner surface.

Composition.—(1) *Sugar*. (2) *Muciluginous substances*.

Action.—Laxative. **Enters into.**—Confectio Sennæ.

PHARMACOLOGY AND THERAPEUTICS

Externally.—Figs cut open and warmed make a popular emollient soothing poultice.

Internally.—They are a pleasant nutritious food, and have a **mild laxative** action. The seeds produce griping by irritating the mucous membrane. Useful in mild **constipation**.

FILIX MAS

Male Fern. N.O. *Filices*

Habitat.—Britain. Found in the Himalayas.

Source.—The rhizome of *Aspidium filix-mas*. Collected late in the autumn, divested of its roots, leaves, dead portions, and carefully preserved.

Characters.—3 to 6 or more inches long. Rhizome $\frac{3}{4}$ to 1 in. in diameter; entirely covered with curved, angular, dark brown bases of the petioles which bear membranous scales; brown externally, green internally. Transverse section shows eight pale yellow fibro-vascular bundles. Odour feeble, disagreeable. Taste first sweetish astringent, then bitter and nauseous.

Identification.—It bears no resemblance to any other drug. Its appearance is most peculiar.

Dispensing hints.—It should not be kept more than a year.

Composition.—(1) *Filicic acid*, a white amorphous powder, the active principle. (2) *Aspidin*, 3 p.c., a poisonous substance. (3) A *fixed oil*. (4) A *volatile oil*. (5) *Resins*.

Action.—Tæniacuge. *Dose.*—60 to 180 grs. powdered.

OFFICIAL PREPARATION

1. **Extractum Filicis Liquidum.** *Syn.*—*Oil of Male Fern*.—A dark green syrupy substance with a disagreeable odour and nauseous taste.

B.P. Dose.—45 to 90 ms.

PHARMACOLOGY AND THERAPEUTICS

Internally.—Male fern is a safe and reliable **anthelmintic** for tapeworm (*Tænia solium* and *T. bothriocephalus*), but being a local irritant it causes vomiting. It must be given in fairly large doses (1 to 2 drs.) to adults on an empty stomach at bed-time, after the bowels have been cleared by a dose of castor oil, and must be followed by a brisk purgative next morning. It is said to expel *Ankylostoma duodenale*.

Prescribing hints.—The liquid extract is best given in fresh milk or emulsified by fresh mucilage of acacia and flavoured by chloroform water. The patient should lie down after taking the draught, because it is liable to make him sick. The purgative must be a powerful one so as to weaken the head of the worm and loosen its hold upon the intestine. The head must be carefully looked for in the stools, and if it is not found, a second dose of the drug should be given two or three days later so as to expel it. But if more time is allowed the worm grows again and gets strong and the effect of the second dose may have no more effect than the first. The efficacy of the drug is enhanced by combining it with oil of turpentine. The drug may also be well emulsified by ovi vitellum.

FENICULI FRUCTUS

Fennel Fruit. N.O. *Umbelliferae*

Syn. I. V.—*Bari Sanf*, *Saurif*, Hind.

Habitat.—Central and Southern Europe, Japan, India.

Source.—The dried fruit of cultivated plants of *Feniculum capillaceum*.

Characters.— $\frac{1}{4}$ to $\frac{1}{2}$ in. long, $\frac{1}{6}$ in. diameter, oblong, curved, glabrous, greenish-brown or pale yellowish-brown, capped by a stylopod and two styles. Odour aromatic. Taste aromatic, sweet. The fruit is readily separated into two mericarps, each of which has five prominent primary ridges, and exhibits in transverse section six large vittæ.

Identification.—It resembles Caraway, Anise, and Conium fruits. Fennel is larger, and its vittæ more prominent.

Composition.—(1) A *volatile oil* (*non-official*). *Dose.*—5 to 15 ms.

Enters into.—Pulv. Glycyrrhizæ Comp. and the

OFFICIAL PREPARATION

1. **Aqua Fœniculi.**—1 in 10. *Dose.*—1 to 2 ozs.

PHARMACOLOGY AND THERAPEUTICS

The same as those of oil of anise or of dill. It is supposed to have the property of increasing the secretion of milk.

GALBANUM. Galbanum

N.O. *Umbelliferae*

Habitat.—Persia, the Levant.

Source.—A gum-resin obtained from *Ferula galbaniflua* and from other species.

Characters.—In tears or in irregular masses of agglutinated tears. Tears rounded or irregular, yellowish-brown or orange-brown externally, yellowish-white internally. Rough, dirty, sometimes translucent. Hard and brittle in cold, soft and sticky with heat. Odour characteristic. Taste bitter, unpleasant. *Impurities.*—Slices of root which remain mixed.

Identification.—It resembles ammoniacum, asafetida, benzoin, distinguished by their respective odours.

Composition.—(1) A Volatile Oil. (2) Sulphurous Resins. (3) *Umbelliferone*. (4) Gum.

Dispensing hints.—It should be heated to 212° F. and strained before use.

Action.—Antispasmodic, expectorant. **B.P. Dose.**—5 to 15 grs.

OFFICIAL PREPARATION

1. **Pilula Galbani Composita.** *Syn. B.P.*—Compound Pill of Asafetida.—1 in 3½. **B.P. Dose.**—4 to 8 grs.

PHARMACOLOGY AND THERAPEUTICS

Its actions and uses are the same as those of asafetida (see p. 260), but less energetic. Sometimes its plaster is applied to **chronic inflammatory swellings**. As it is scarcely ever prescribed now, it might with advantage be removed from the B.P.

GALLA. Galls

N.O. *Cupuliferae*

Syn.—Nut-galls. **Syn. I. V.**—*Majufal*, Beng. *Maiful*, Hind.

Habitat.—Asia Minor. Imported from Persia, Greece and Turkey.

Source.—Excrescences on a species of oak *Quercus infectoria*, resulting from the puncture and deposition of an egg or eggs of *Cynips gallæ tinctoriæ*.

There are two kinds of galls. The *blue, black or non-perforated galls* collected before the escape of the mature insect are the best. The *white or perforated galls* collected after the escape of the insect are inferior in quality.

Characters.—Hard, heavy, sub-globular, ½ to ¾ in. in diameter, tuberculated on surface, tubercles and intervening spaces smooth, dark bluish-

green or dark olive-green externally, yellowish or brownish-white within, with a small central cavity. No odour. Taste intensely bitter.

Identification.—Easy.

Composition.—(1) *Tannic acid* (off.) 60 to 70 p.c. (2) *Gallic acid* (off.) 2 to 5 p.c.

Incompatibles.—The same as those of tannic acid (*q.v.*).

OFFICIAL PREPARATIONS

1. **Unguentum Gallæ.**—1 in 5. Pale brown.

2. **Unguentum Gallæ cum Opio.**— $7\frac{1}{2}$ p.c. Opium. Brown. May be made directly by mixing Opium 15 grs., Galls 37 grs., and Benzoated Lard 148 grs.

ACIDUM GALLICUM

Gallic Acid. $C_6H_2(OH)_3COOH, H_2O$

Source.—A trihydroxybenzoic acid, prepared by the action of diluted sulphuric acid on tannic acid.

Characters.—In whitish or slightly brownish acicular needles. No odour. Taste faintly acid. *Solubility.*—1 in 100 of cold; 1 in 3 of boiling water; 1 in 5 of alcohol (90 p.c.); 1 in 12 of glycerin.

Identification.—It is recognised by its pale fawn colour, the shape of its crystals and the absence of odour.

Incompatibles.—Spt. ætheris nitrosi, persalts of iron, metallic salts and caffeine.

Action.—Said to be a remote astringent.

B.P. Dose.—5 to 15 grs.

NON-OFFICIAL PREPARATION

1. **Gallanol.** *Syn.*—*Gallic Acid Anilide.*—In colourless crystals, sparingly soluble in water. Used as a substitute for chrysophanic acid.

ACIDUM TANNICUM

Tannic Acid. $C_{14}H_{10}O_9, 2H_2O$

Syn. B.P.—Digallic acid. Tannin.

Source.—May be extracted by water saturated with ether from galls which have been subjected to a special fermentation.

Characters.—A light brownish powder consisting of thin glistening scales. Odour characteristic. Taste strongly astringent.

Identification.—The general appearance, the faint but characteristic odour and the colour help recognition. Sometimes it may be confounded with benzoic acid, but the characteristic odour of benzoin distinguishes it.

Incompatibles.—Gelatin gives a yellowish-white precipitate (not with gallic acid), alkalis, mineral acids, antimonial, lead and silver salts, ferric salts, and vegetable alkaloids.

B.P. Dose.—2 to 5 grs.

OFFICIAL PREPARATIONS

1. **Glycerinum Acidi Tannici.**—1 in 5, or 1 in $6\frac{1}{2}$ by weight.

2. **Suppositoria Acidi Tannici.**—3 grs. in each.

3. **Trochiscus Acidi Tannici.**— $\frac{1}{2}$ gr. in each. *Dose.*—1 to 6.

NON-OFFICIAL PREPARATIONS

1. **Tannalbin**.—A compound of tannin and albumen. A pale brown tasteless insoluble powder. An intestinal disinfectant and astringent, soluble in the intestines. *Dose*.—8 to 15 grs.

2. **Honthin**.—A keratinized greyish-brown compound of tannin and albumen. Very useful in *infantile diarrhæa*. *Dose*.—10 to 30 grs.

3. **Tannigen**. *Syn.*—*Di-Acetyl Tannin*.—A greyish-white powder insoluble in water. Both tannalbin and tannigen appear in the urine as gallic acid. In *enteritis* and *infantile diarrhæa*. *Dose*.—3 to 8 grs.

4. **Tannoform**.—A compound of tannic acid with formic aldehyde, in greyish-yellow powder insoluble in water. An excellent anhydrotic, antiseptic and siccative. As a dusting powder in *bromidrosis*, *bed-sores*, *soft chancres*, *eczema*, &c. Internally in *infantile diarrhæa*. *Dose*.—10 to 15 grs.

5. **Tannone**.—A condensation product of tannin and urotropine. A brownish odourless insoluble powder. Found valuable in *tubercular* and *typhoid diarrhæa*. *Dose*.—5 to 15 grs.

6. **Tanocol**.—A compound of tannin and gelatin. Intestinal astringent. *Dose*.—15 grs.

PHARMACOLOGY

Externally.—Tannic acid or substances containing it coagulate albumen, gelatin and mucus, but gallic acid does not. Tannic acid has no action on the unbroken skin, but applied to an exposed mucous membrane or a denuded surface it coagulates the mucous and the albuminous secretions, and forms a firm insoluble protective covering over the part. The coagulated albumen or gelatin resists putrefaction. Absorbed into the tissues, it coagulates the interstitial fluids, and condenses the albuminous and connective tissues, and thereby diminishes the serous discharge. Hence it is a **powerful local astringent**. It arrests hæmorrhages partly by causing plugging of the small vessels and partly by the production of a coagulum in the surrounding tissues, but it does not diminish the calibre of the vessels themselves as it has no action on the muscular coats. It is therefore a **local hæmostatic**. Rosenstirn's experiments prove that the blood-vessels are slightly dilated, but the strong constringent effect produced by the coagulum more than counterbalances this feeble dilatation. It slightly depresses the local sensory nerves, and has feeble **antiseptic** and **irritant** properties.

Internally. **Mouth**.—Tannic acid causes dryness of the mouth with a feeling of astringency and of stiffness of the tongue and throat, owing to the coagulation of the secretions of the mucous membranes. It slightly depresses the common sensory nerves and the special nerves of taste.

Stomach.—Its action on the stomach is the same as on the mouth. A portion of it is converted into an albuminate, which is very slow of absorption and is consequently more readily converted into gallic acid in the intestines. Large doses **impair digestion by precipitating**

pepsin, and often cause **gastric irritation** and vomiting, but stop hæmorrhage by their **local hæmostatic** property.

Intestines.—Here also it acts as an astringent and hæmostatic so long as it is not **converted into gallic acid** and alkaline tannates. Therefore, to obtain these effects, it should be given in sufficiently large doses. The conversion into gallic acid occurs thus:— $C_{27}H_{22}O_{17}$ (tannic acid) + $4H_2O = 3H_3C_7H_3O_5$ (gallic acid) + $C_6H_{12}O_6$ (glucose). The undecomposed tannates and unabsorbed gallates are thrown off with the fæces. Tannic acid cannot affect the biliary secretion.

Blood.—Tannic acid enters the blood mostly as gallates and partly as tannates and circulates as such. Injected into a vein it causes death by thrombosis.

Remote action.—As the gallates and the alkaline tannates thus absorbed cannot coagulate albumen or produce any local astringent effect, it is impossible to accept the theory which many advocate that gallic acid acts as a remote astringent.

Elimination.—There is a great diversity of opinion as to its excretion. According to some, any that has been absorbed is decomposed in the human body, because no derivative of tannic acid can be detected in the human urine or other secretions; although gallates and traces of tannates are found in the urine of animals. But Stockman found gallic acid with **traces** of tannin in the urine when pure tannin was given by the mouth; and a large amount of tannin with a little gallic acid in the urine, when sodium tannate was administered.

THERAPEUTICS

Externally.—As a **local hæmostatic**, tannic acid is largely employed in **hæmorrhages** from the nose, the rectum, the bladder, the urethra, the uterus, wounds, ulcers, &c. It may be dusted over **wounds** or **ulcers**, or used as a snuff or a nasal douche in **epistaxis** or as gall ointment or a suppository in **hæmorrhoids**, or as a pessary (10 grs. to 1 dr.) in **cancer of os**, or as a bougie in **gonorrhoeal hæmorrhage**. As a **local astringent**, it has been found useful in subduing mild forms of subacute or chronic inflammatory processes and discharge from the skin, as in **eczema**, **intertrigo** (Glyc. Acidi Tannici); the ear, in **otorrhœa** (Glyc. Acid. Tannici); the eye, as in **conjunctivitis** and **corneal vascularity** (a collyrium 4 grs. to 1 oz.); the nose, as in **ozæna** (a douche, snuff or paint); the vagina, as in **leucorrhœa** (an injection, douche or pessary); the uterus, as in **cancer** or **ulcerated os** (pessary or cotton-wool soaked in tannic acid and glycerin); the urethra, as in **gonorrhœa** and **gleet** (10 grs. to 1 oz. as an injection); the bladder, as in **cystitis** (injection); and the rectum, as in **ulcers**, **fissures** and **prolapse of the rectum** (an injection and suppository). Dr. Ringer recommends tannic acid pomade (tannin 1 dr., glycerin $\frac{1}{2}$ dr., balsam of Peru 20 drops, bitter almond oil 4 drops, lard 1 oz.) in **dandruff**.

Internally. Alimentary canal.—Tannic acid makes a very good dentifrice for **bleeding and ulcerated gums**. Glycerin of tannic acid is a valuable application in **ulcerative stomatitis, subacute, chronic or aphthous sore throat, relaxed or elongated uvula, enlarged tonsils, &c.** A gargle (Glyc. acidi tannici 1 dr. to 1 oz.), a spray (1 dr. in rose water 10 ozs.) or lozenges may be used in these cases. An insufflation of tannin with starch makes also an excellent application for the mouth and larynx. It is a valuable remedy for **gastric and intestinal hæmorrhage**, but it should be given in large doses, say 30 to 40 grs. every one or two hours. It is a valuable **antidote in poisoning by alkaloids and antimonial salts**. Tannic acid is largely employed in **diarrhoea** either acute or chronic. Tubercular, enteric or dysenteric diarrhoea often yield to its use. The writer has obtained good results in **cholera**, especially in the hæmorrhagic variety, by giving tannic acid 10 grs. and diluted sulphuric acid 10 ms., along with warm rectal injections of tannic acid (30 grs. to 1 qt. of hot water) during collapse.

Notwithstanding the absence of all proof of their action as remote hæmostatics or remote astringents, gallic acid and tannic acid still find favour with many old-fashioned physicians in the treatment of **internal hæmorrhages**, such as hæmoptysis and hæmaturia; and of **excessive secretions** from any part of the body, as phthisical night-sweats. As a remedy for **albuminuria** it is valueless.

Prescribing hints.—The different forms in which tannic acid may be used externally have already been noticed. Internally it may be given in solution (*see* p. 84), cachets, or pills (*see* p. 89). In the absence of tannic acid any vegetable infusions containing tannin, such as strong tea or decoction of oak-bark, may be employed in alkaloidal poisoning. It should not be combined with ferric salts. Caffeine is precipitated by tannic acid but is redissolved if the latter be in excess.

GAULTHERIÆ OLEUM

Oil of Gaultheria

(*Ind. and Col. Addendum*)

Syn. B.P.—Oil of Winter-green.

Habitat.—North American Colonies.

Source.—The oil distilled from the leaves of *Gaultheria procumbens* (N.O. *Ericaceæ*), or from the bark of the sweet birch, *Betula lenta* (N.O. *Betulaceæ*). It contains at least 90 p.c., generally more, of natural methyl salicylate.

Characters.—Colourless or slightly yellowish. Odour strong, characteristic. Taste warm, sweetish, aromatic. Sp. gr. 1.176 to 1.187.

B.P. Dose.—3 to 10 ms.

NON-OFFICIAL PREPARATIONS AND DERIVATIVES

1. **Methyl Salicylas. U.S. (Synthetic).**—A colourless liquid having the odour and taste of oil of Gaultheria. Less irritating than the natural oil.

2. **Sanoform.** *Syn.* — *Di-iodo-methylsalicylate*. — A white crystalline powder insoluble in water. Used externally as a non-irritant substitute for iodoform.

3. **Mesotan.** — *Methoxy-methylester of Salicylic Acid*. Is free from the penetrating odour of Methyl Salicylas. An inunction of 1 part Mesotan with 2 parts of Olive Oil is very useful in *rheumatism and gout*, especially if combined with the internal administration of aspirin. It should only be smeared on the part, which is then wrapped in a layer of absorbent cotton. If it is rubbed in very vigorously, it produces considerable irritation and a papular eruption.

4. **Ulmarene.** — A similar preparation. Makes an admirable ointment if combined with Menthol and Lanoline. Gelatin capsules for internal administration each containing 8 ms.

PHARMACOLOGY AND THERAPEUTICS

The actions and uses of this oil are very much the same as those of the salicylates (*see* p. 201). It is largely employed in America, externally and internally in acute rheumatism. For mode of application, *see* Mesotan (above). A proprietary preparation known as "*Betul-ol*" is only *Oleum Gaultheriæ*.

GELATINUM. Gelatin

Source. — The air-dried product of the action of boiling water on such animal tissues as skin, tendons, ligaments, and bones.

Characters. — In translucent, almost colourless, sheets or shreds. A solution in 50 parts of hot water solidifies to a jelly on cooling. Insoluble in alcohol (90 p.c.) and ether. Tannin precipitates it.

Enters into. — The preparation of Suppositoria Glycerini and Lamellæ.

USES

Gelatin is used as a basis for several pharmaceutical preparations such as suppositories, pessaries, bougies, discs, gelatin capsules, and as a coating for pills. Glyco-gelatin (gelatin 1, glycerin 2½, orange flower water 2½, ammoniated solution of carmine *q.s.* to colour) is an excellent basis for throat pastilles (*see* p. 72). Each should weigh 30 grs. It is largely employed in dietary for making jellies, &c.

Medicinally it acts as a **hæmostatic**, due according to Zibell to an admixture of lime 0.6 p.c. in solution. A 5 p.c. to 10 p.c. solution may be locally used in **wounds, epistaxis, &c.**, or as a sterilized concentrated saline solution hypodermically into the gluteal region in **internal hæmorrhages**.

GELSEMI RADIX

Gelsemium Root. N.O. *Loganiaceæ*

Habitat. — The south-eastern United States.

Source. — The dried rhizome and rootlets of *Gelsemium nitidum*, the Yellow Jasmine.

Characters.—Cylindrical, about 6 in. long. $\frac{1}{4}$ to $\frac{3}{4}$ in. thick, brown or dark brownish-violet, with fibrous roots occasionally attached. Roots tortuous, finely wrinkled. Odour aromatic. Taste bitter.

Composition.—(1) *Gelsemine*, a crystallizable alkaloid. (2) *Gelsemin*, a resinoid substance. (3) *Gelsemic acid*, inert but serves a test. (4) *Gelseminine*, a poisonous amorphous alkaloid. (*Carefully note the spelling of these bodies.*)

Action.—Analgesic, antispasmodic. *Dose.*—5 to 30 grs. powdered.

OFFICIAL PREPARATION

1. *Tinctura Gelsemii*.—1 in 10. Pale brown. **B.P. Dose.**—5 to 15 *ms*.

NON-OFFICIAL PREPARATIONS

1. *Gelseminina*.—In yellowish-white sparingly soluble crystals. Its salt, *Gelseminine Hydrochloridum*, white granular crystals, freely soluble in water, was formerly used to dilate the pupil. *Dose.*— $\frac{1}{16}$ to $\frac{1}{8}$ gr.

2. *Gelsemin*.—A pale brown extractive, used as a *hypnotic* and in *neuralgia*. *Dose.*— $\frac{1}{2}$ to 2 grs. *Must not be mistaken for the alkaloids.*

PHARMACOLOGY

Externally.—Topically applied it is a **mydriatic**.

Internally. **Heart and circulation.**—No action in small doses. In toxic doses it powerfully **depresses the heart** and causes a fall of blood-pressure, due to the paralysis of the vagal ends.

Respiration.—In large doses it is a **powerful respiratory sedative**, producing weakness of respiration and death from **asphyxia**. This is caused by the direct paralysis of the respiratory centres in the medulla and cord.

Nervous system. *Brain.*—No action on cerebral centres except drowsiness caused by asphyxia.

Spinal Cord.—It **depresses** first the functional activity of the **anterior cornua**, producing **paralysis** of all the **muscles** of the **body**; then the sensory tracts, with consequent **anæsthesia** which is but slight. The motor nerve-trunks are not affected, but their end-plates only are paralysed just before death. As a consequence of these actions, the gait of the patient becomes staggering and he is no longer able to walk straight, and his general sensibility is lessened. Convulsions precede death, due probably to the asphyxiated condition of the blood.

Eye.—It **paralyses the ocular muscles** causing **diplopia** and **ptosis**, owing to the paralysis of the motor cells (centres) in the floor of the fourth ventricle and Sylvian aqueduct which are a continuation of the anterior cornual cells. Opinions differ as to its action on the pupil. Some say that it is **dilated**, others that it is **contracted**.

Toxic action.—The symptoms are generally seen to appear in the following order:—Tolerably large doses produce browache, giddiness, ocular pain,

dimness of sight. Large doses diplopia and contraction of the pupil. Still larger doses ptosis, weakness of ocular muscles and staggering gait, and sleepiness. Poisonous doses inability to articulate or walk, tremor of the head, quick feeble pulse, impaired sensibility, general muscular paralysis, cold sweat, fall of temperature, slow and laboured respiration, occasional convulsions and death from asphyxia. 2 ozs. of tincture have caused death.

Antidotes.—Emetics or pump. Tannin and potassium bicarbonate freely. Warmth, free stimulation, prolonged artificial respiration, electricity. Strychnine and atropine hypodermically. Nitroglycerin is a rapid and perfect antidote.

THERAPEUTICS

Externally.—Gelsemium is rarely used now as a dilator of the pupil. Atropine and homatropine are used in its place. However, ophthalmic discs containing gelsemine $\frac{1}{100}$ gr. each are obtainable.

Internally.—Gelsemine is really a valuable medicine in **dental neuralgia** and **migraine**. It often relieves the former even when the cause is not removed. Its effects are most marked in **neuralgia** of the branches of the **5th nerve** supplying the lower jaw. It may be given alone or better still with butyl-chloral hydrate (*q.v.*), gelsemine hydrochloride $\frac{1}{100}$ gr. with pilula butyl-chloral (*see* p. 291) makes an excellent combination, and may be given every two or three hours until the pain is relieved. Sometimes it requires to be pushed till the physiological symptoms appear. It is said to benefit **ovarian neuralgia** and **dysmenorrhœa**. Ringer found the tincture in 10 m. doses would relieve some forms of **Ménière's disease** and in 5 m. doses every $\frac{1}{4}$ hour the **pain** of gall-stones. As an antispasmodic in **spasmodic coughs**, **asthma**, **tetanus**, &c., it is rarely used now.

Caution.—The drug should be used with great care. It should be immediately stopped, as soon as ptosis or weakness of the muscles are noticed. Its value as a muscular depressant is negated by other untoward effects. Extra precaution should be taken while prescribing its alkaloids, as **serious mistakes** may occur during dispensing. **Gelsemine** is often mistaken for **gelseminine**.

GENTIANÆ RADIX

Gentian Root. N.O. *Gentianaceæ*

Habitat.—The Central and Southern European Mountains.

Source.—The dried rhizome and roots of *Gentiana lutea*.

Characters.—In yellowish-brown, entire or longitudinally split, wrinkled, cylindrical pieces, seldom 1 in. thick, varying in length, encircled by leaf-scars and terminated by a leaf-bud. Tough when moist, brittle when dried. Fractured surface reddish-yellow, central portion soft, not radiate. Odour characteristic. Taste first sweetish then bitter. Should not yield reactions with starch.

Identification.—It should not be confounded with *Belladonna* and *Pyrethrum* roots. Their distinguishing characters can be better studied by a reference to the following table :—

Characters	Gentian	Belladonna	Pyrethrum
Colour	Yellowish - brown externally, reddish-yellow* internally	Pale greyish-brown externally, white and starchy internally	Brown, with shining black points internally
Fractured surface	Central portion soft, not radiate. An irregular, dark red ring near the outside bark	Near to the cambium ring scattered group of vessels and fibres not radiate. Not annular ring. Some cells contain crystals of calcium oxalate	Traversed by large medullary rays with dark points
Odour	Fragrant, characteristic, which itself may distinguish it	Nil	Characteristic
Taste	Sweetish at first, very bitter afterwards		Causes a pricking sensation and salivation

Composition.—(1) *Gentio-picrin*, the active principle, a bitter glucoside which splits up into (a) glucose, (b) gentiogenin. (2) *Gentianic* or *genthisic acid* combined with gentio-picrin. (3) *Gentianose*, a sugar. (4) *Gum*. (5) A *Volatile Oil*. No tannin.

Incompatibles.—Iron and lead salts, silver nitrate. Gentian, though it contains no tannin, cannot be prescribed with iron as it darkens the mixture.

Action.—Stomachic, bitter tonic.

OFFICIAL PREPARATIONS

1. **Extractum Gentianæ.**—Aqueous. **B.P. Dose.**—2 to 8 grs.
2. **Infusum Gentianæ Compositum.**—1 in 80. **B.P. Dose.**— $\frac{1}{2}$ to 1 oz.
3. **Tinctura Gentianæ Composita.**—1 in 10. Golden brown. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.

NON-OFFICIAL PREPARATION

1. **Inf. Gentianæ Comp. Con. B.P.C.**—Gentian 2, Bitter Orange Peel 2, Lemon Peel 1, Tincture of Fresh Lemon Peel 1, Alcohol (90 p.c.) 4, Water *q.s.* to 1 pint. By maceration, 1 equal to 8 of the B.P. infusion. **Dose.**— $\frac{1}{2}$ to 1 dr.

PHARMACOLOGY AND THERAPEUTICS

Its actions and uses are similar to those of *calumba* (*q.v.*). It is more frequently used than other bitters for its non-astringency.

* If dried in an oven it is black.—C. & D., 1897, vol. ii, p. 198.

According to Whitla the infusion with a mineral acid checks vomiting of pregnancy and retching remarkably well. The writer has seen it constipate, but how this occurs he cannot explain.

GLUCOSE. (*Non-official*)

Syn.—Dextrose. Grape Sugar.

Source.—By acting upon starch with dilute hydrochloric acid.

Characters.—White lumps or a thick sticky mass.

OFFICIAL PREPARATION

1. **Syrupus Glucosi.**—A good excipient for pills.

PHARMACOLOGY AND THERAPEUTICS

Externally.—The injection of a 5 p.c. solution (which is isotonic with blood) into the loose tissue of the axilla is a valuable method of treatment of shock following severe operations, the collapse of cholera, and wasting diseases. It is undoubtedly far more valuable than the ordinary injection of normal saline solution and deserves to be more extensively used. Glucose tubes are obtainable, each of which will make one pint of injection.

Internally.—Glucose is a valuable article of diet in enteric fever and serves to counteract the emptiness of the glycogen reservoirs which is such a marked feature of this disease.

GLUSIDUM. Gluside



Syn. B.P.—Glucosimide. **Syn. Commercial.**—Saccharin.

Source.—Gluside or Benzoyl-sulphonimide is a sweet imide derived from toluene, a derivative of coal tar.

Characters.—A light, white, minute crystalline powder. Taste intensely sweet in dilute solutions. **Solubility.**—1 in 400 of cold, and 1 in 24 of boiling water; 1 in 25 of alcohol (90 p.c.), slightly in ether and chloroform, also in diluted solutions of ammonia and bicarbonate of soda.

Impurities.—Sugar, Sulphamido-benzoic acid.

Action.—Antiseptic. A substitute for sugar. **Dose.**— $\frac{1}{2}$ to 2 grs.

NON-OFFICIAL PREPARATIONS

1. **Soluble Gluside.** **Syn.**—*Saccharinum Solubile*.—90 p.c. in combination with soda. In yellowish-white granules easily soluble and more palatable. **Dose.**— $\frac{1}{2}$ to 2 grs.

2. **Elixir Glusidi. B.P.C.**—Saccharin 5, Sod. Bicarb. 3, Alcohol (90 p.c.) 12.5, Water *q.s.* to 100. 1 dr. equal to 3 grs. 20 ms. are sufficient to sweeten 4 ozs. of a mixture. **Dose.**—5 to 20 ms.

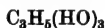
3. **Saccharini Tabellæ (disc).**— $\frac{1}{2}$ gr. in each.

4. **Diabetin.** **Syn.**—*Levulose, Inverted Sugar*.—Whitish crystalline powder soluble in water, with a strong sweetening power suitable for diabetic patients.

PHARMACOLOGY AND THERAPEUTICS

In large doses, gluside is an **antiseptic** and passes out with the urine unaltered. It is chiefly used for its sweetening property to cover the taste of unpleasant drugs, and as a substitute for sugar in **diabetes, obesity, dyspepsia, &c.** For its antiseptic action it is useful in cystitis. Soluble gluside being more palatable is better suited for flavouring purposes, as ordinary saccharin leaves a disagreeable after-taste.

GLYCERINUM. Glycerin



Source.—Glycerin or Glycerol is a trihydric alcohol with a small percentage of water. Obtained by the interaction of alkalis, or of superheated steam with fat and fixed oils.

Characters.—A clear, colourless, inodorous, sweet, syrupy liquid, miscible with water and alcohol (90 p.c.); insoluble in ether, chloroform, and fixed oils. It is neutral, hygroscopic, sp. gr. 1.260. *Impurities.*—Arsenic, copper, lead, iron, calcium, sodium, potassium, ammonium, chlorides, sulphates, cane and grape sugars, butyric acid, fixed mineral matter, and organic matter.

Identification.—The colourless oily appearance, the absence of smell and sweet taste help diagnosis. Most of the B.P. liquids are oily and have characteristic odours.

Action.—Antiseptic, emollient, demulcent.

B.P. Dose.—1 to 2 drs.

Enters into.—The preparation of all Glycerins (*see* Table p. 27), all Lamellæ (*see* Table p. 30), Conf. Sulph. Ext. Cinch. Liq., Ext. Sarsæ Liq., Lin. Pot. Iod. c. Sapone, Liq. Ethyl Nitratis, Liq. Thyroidei, Lotio Hydrargyri Nigra, Mel Boracis, Pil. Ferri, Pil. Quininæ Sulph., Syr. Pruni Virg., Tr. Chlor. et Morph. Co., Tr. Rhei Co., Ung. Acid. Carbol., Ung. Iodi, Ung. Sulph. Iod., and the

OFFICIAL PREPARATION

1. **Suppositoria Glycerini.**—70 p.c. Translucent cones. Prepared by softening gelatin $\frac{1}{2}$ oz. in water and dissolving it in glycerin $2\frac{1}{2}$ ozs., on a water-bath, and evaporating till the mixture weighs 1563 grs., when it is poured into moulds.

NON-OFFICIAL PREPARATIONS

1. **Glycerin Jelly.**—Gelatin 140 grs., Rose Water 6 ozs., soak and dissolve, and add White of Egg $\frac{1}{2}$ oz. Heat, and add Glycerin 6 ozs., and Salicylic Acid 12 grs. Mix, filter, and bottle when warm. Useful in chapped hands, cracked lips and nipples, and for the toilet.

2. **Glycero-alcohol.** *Syn.*—*Petit's Liquor.*—Glycerin 333, Distilled Water 146, Alcohol (95 p.c.) q.s. to measure 1000. It keeps indefinitely without evaporation. Recommended as a solvent for alkaloids and active principles by the French.

3. **Glycerinum c. Aqua Rosæ.**—Glycerin 2, Rose Water 3. **Mix.** A pleasant emollient for the skin.

4. **Glyceritum Vitelli U.S.** *Syn.* — *Glyconin.* — Yolk of Egg 45, Glycerin 55. An application to *burns, cracked nipples, &c.*

5. **Antiphlogistine.**—A pasty mass, said to extract fluid from the tissues and to relieve pain in *pneumonia, pleurisy, &c.* Contains Glycerin, Boric and Salicylic Acids, Iodine, Ferrous Carbonate, and various aromatic oils, with an earthy basis.

6. **Thermofuge.**—A somewhat similar preparation. Used as a substitute for poultices.

PHARMACOLOGY

Externally.—Glycerin adheres to the surface to which it is applied, and **absorbs moisture.** It keeps the parts moist and does not itself evaporate. It readily penetrates the unbroken skin, and carries with it many substances, such as alkaloids, neutral principles, alkalis, &c., when mixed with it. It is a powerful **antiseptic**, an **emollient**, and a **demulcent.** It renders the skin supple, especially when diluted with water, and allays burning or tingling. Undiluted glycerin is an **irritant** to the mucous surface, and occasionally to the skin.

Internally. Alimentary canal.—Undiluted glycerin makes the mouth clammy and sticky. It is a nutrient, because a portion of it when swallowed is absorbed and oxidized in the body, or may go to form adipose tissue. Hence, when continued for a long time, it is sometimes seen to increase body-weight. It is doubtful whether it can affect the metabolism of nitrogenous tissues, but there is evidence that it cannot. In large doses it acts as a **laxative.** Injected into the rectum, it moves the bowels by increasing vermicular contraction of the rectum and the lower bowels by its local irritant effects.

Liver.—Glycogenic function may to some extent be influenced but it is doubtful whether artificial glycosuria can be prevented.

Blood.—It is freely absorbed by all surfaces. Large doses given to animals cause destruction of red corpuscles, and the hæmoglobin is dissolved in the plasma, leading to **hæmoglobinuria.** It is probable that the marked tendency to hæmorrhages which is seen in various forms of Pancreatic disease is due to the circulation in the blood of glyceryl derivatives, derived from the areas of "fat-necrosis," which have been produced by the action of steapsin upon the subperitoneal fat.

Elimination.—Glycerin is excreted from the body as propionic, formic and other acids. The urine of persons taking glycerin gives the copper and fermentation tests for sugar, due to the appearance of a reducing product which is not sugar. After very large doses, the urine becomes dark from the presence of hæmoglobin.

PHARMACEUTICAL USES AND THERAPEUTICS

Pharmaceutically.—On account of its valuable physical properties, glycerin is peculiarly fitted for pharmaceutical and dispensing uses

It makes an excellent all-round excipient for pills when combined with acacia or tragacanth mucilage (*see* p. 86). It is used in the preparation of suppositories, pessaries, pastils, jellies, glyco-gelatin preparations and ointments; and a solvent for many alkaloids, active principles, acids, alkalis, neutral salts, glucosides, iodine, bromine, &c. It is a valuable adjunct to lotions for the skin and the hair. As a flavouring agent it is largely employed as a substitute for syrups in mixtures, and as a preservative for organic preparations, such as thyroid solution. As a sweetener and preserver of mixtures it is admirably suited to the Indian climate.

Externally.—As an *emollient*, glycerin diluted with water (1 in 3) or glycerin. c. aqua rosæ is the best application for **chapped lips** and **hands**, **rough, dry, furfuraceous skin** and for every kind of skin disease, such as **herpes**, **eczema**, **lichen**, **psoriasis**, **xeroderma**, &c., which requires an emollient. Mixed with boric acid it is serviceable in **pityriasis** of the body and scalp, and **aphthous** condition of the genitals. It removes dryness of the **meatus** of the **ear**, and heals **excoriation** and **fissures**. It is the best preventive for **bed-sores**, when gently rubbed into the parts, before they become tender and red. A 5 p.c. solution of both glycerin and Friar's balsam in rose water prevents a further breaking out of **acne**, when once it is checked. Cotton-wool soaked in glycerin and applied to the **os uteri**, by causing a copious watery discharge, relieves congestion of that organ. Many anodynes and antiseptics may be applied similarly by dissolving them in glycerin.

Internally. **Alimentary canal.**—The lips, the tongue and the gums covered with **sordes**, as in acute febrile diseases, are easily cleaned by keeping them moist with glycerin. The dry, red, glazed mucous membrane of the tongue and throat is made moist and supple by rinsing the mouth with glycerin and water and thus relieving any **reflex cough** if present. As a **laxative** it is never used by the mouth, but the writer always combines it with castor oil to render it less disagreeable and more effective. Glycerin (1 to 4 drs.) may be injected into the rectum by a special syringe to open the bowels in **constipation**. The official suppository may conveniently be used for the same purpose and is particularly useful in cases where there is a prejudice against the use of enemata. Hollow suppositories composed of oil of theobroma may be filled with 20, 45 or 90 grains of glycerin; they are more prompt in their action than the official suppository. The injection of glycerin is contra-indicated in **piles** and is useless if the **fecal accumulation** is very high up.

Lungs.—A tea-spoonful of glycerin alone or diluted with water often relieves **cough**, even that of phthisis. A little lemon juice added to it, makes it more efficacious and moderates its sweetness. Glycerin cannot supply the place of cod-liver oil, but it can be usefully combined with it.

GLYCYRRHIZÆ RADIX

Liquorice Root. N.O. *Leguminosæ***Syn. I. V.**—*Jashthimadhu*, Beng. *Mectha lukri*, *Mulchthi*, Hind.**Habitat.**—Southern Europe, England, Persia, Afghanistan, India.**Source.**—The peeled root and peeled subterranean stem of *Glycyrrhiza glabra*, and other species.**Characters.**—Long, cylindrical, before being peeled dark brown, and longitudinally wrinkled; when peeled yellow, fibrous. Odour faint. Taste characteristic, sweet, free from bitterness.**Identification.**—It somewhat resembles pyrethrum and taraxacum, which are not sweet. In India the root of *Abrus precatorius* is often sold for the B.P. root.**Composition.**—(1) *Glycyrrhizin*, a yellow amorphous glucoside. (2) *Asparagin*. (3) Grape sugar, resin, starch, malic acid, &c.**Action.**—Demulcent, a sweetening agent.**Enters into.**—Liq. Sarsæ Co. Conc., Pil. Hydrarg., and the

OFFICIAL PREPARATIONS

1. **Extractum Glycyrrhizæ.**—An excipient. *Dose.*—5 to 30 grs. *Enters into.*—Conf. Sennæ and Decoctum Aloes Co.2. **Extractum Glycyrrhizæ Liquidum.**—The product is usually acid. Ammonia may be added as a preservative. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr. *Enters into.*—Mist. Sennæ Co. and Tr. Aloes.3. **Extractum Glycyrrhizæ Spirituosum** (*Ind. and Col. Add.*).—Extract of Liquorice 10 ozs., Alcohol (90 p.c.) 5 ozs., Water *q.s.* to 1 pint. By solution. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr. For use in India and Eastern Colonies. Keeps better than the liquid extract.4. **Pulvis Glycyrrhizæ Compositus.** *Syn.*—*Pulvis Pectoralis*.—1 in 6. A mild aperient. **B.P. Dose.**—1 to 2 drs.

NON-OFFICIAL PREPARATIONS

1. **Glycyrrhizinum Ammoniatum, U.S.**—Glycyrrhizin precipitated from an aqueous solution, purified and recombined with Ammonia. Garnet-coloured shining scales having the persistent sweet taste of Liquorice. 1 gr. will suffice to flavour 6 ozs. of water. *Dose.*— $\frac{1}{2}$ to 5 grs.2. **Elixir Pectorale, P.G.** *Syn.*—*Liquor Pectoralis*.—King of Denmark's chest mixture. Ext. Liquorice 1, Fennel Water 3, Anisated Liquid Ammonia 1. *Dose.*—1 dr.

PHARMACOLOGY AND THERAPEUTICS

Internally.—Being sweet it increases the flow of saliva. It is an excellent demulcent, and is largely employed in relieving sore throat, for which pieces of "stick liquorice" are kept in the mouth. The dried root has no laxative effect, but Pulv. Glycyrrhizæ Co. is a mild laxative in virtue of its senna and sulphur. Liquorice makes an excellent excipient and disguises the taste of many nauseous drugs such as aloes, ammonium chloride, cascara sagrada, senna, senega, turpentine, and many bitter substances.

GOSSYPIUM. CottonN.O. *Malvaceæ***Syn.**—Cotton-wool. **Syn. I. V.**—*Tulla*, Beng. *Rui*, Hind.**Habitat.**—Warm and Tropical Countries. Cultivated in India.**Source.**—The hairs of the seeds of *Gossypium barbadense* and other species of *Gossypium*, from which fatty matter has been removed. Commonly known as "Absorbent Cotton-Wool."**Characters.**—Well known. It should be readily wetted by and quickly sink in water.

USES

Externally.—The economic uses of cotton are well known. It is chiefly used as a padding for splints, and as a protective covering for **blistered, burned or inflamed surfaces**, as in rheumatism, gout, erysipelas, &c. A thick layer surrounding the entire limb, and covered with a piece of oil-silk and bandaged, is the best local treatment in **phlegmasia dolens**. In the same way a cotton-wool jacket is very useful in the treatment of **bronchitis, pneumonia, pleurisy**, &c. Cotton-wool medicated with boric, carbolic and salicylic acids, thymol, iodoform, eucalyptol, sal-alembroth, &c., is employed as an antiseptic dressing. Sterilized cotton is the best substitute for corks in bacteriological experiments. Pyroxylin is used for making collodion.

PYROXYLINUM. Pyroxylin

Source.—It is dinitrocellulose, though commonly called gun-cotton, which is trinitrocellulose, prepared by immersing cotton 1, in a mixture of sulphuric acid 5, and nitric acid 5 for three minutes, and then washing, draining, and drying on a water-bath. **Solubility.**—Readily in a mixture of equal volumes of ether and alcohol (90 p.c.).

Enters into.—Collodium, Collodium Flexile, Collodium Vesicans (*see* p. 302).

Dispensing hints.—Becomes sometimes insoluble on keeping. It is best preserved by moistening the cotton with methylated spirit and placing it in a well-stoppered jar. Dry it before use.

GOSSYPII RADICIS CORTEX

Cotton Root Bark

*(Ind. and Col. Addendum)***Habitat.**—India, Eastern, North American, and Western Colonies.**Source.**—The dried root-bark of *Gossypium herbaceum*.**Characters.**—In thin flexible bands or quilled pieces, covered with a thin brownish-yellow periderm. Inodorous. Taste slightly acrid astringent.

OFFICIAL PREPARATIONS

1. **Decoctum Gossypii Radicis Corticis.**—Bark bruised 4 ozs., Water 2 pints. Boil down to 1 pint. **B.P. Dose.**— $\frac{1}{2}$ to 2 ozs.
2. **Extractum Gossypii Radicis Corticis Liquidum.**—1 in 1. Bark 20 ozs., Glycerin 5 ozs., Alcohol (90 p.c.) q.s. Percolate to 1 pint. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.

NON-OFFICIAL PREPARATIONS

1. **Extractum Gossypii Radicis Corticis.**—Semi-alcoholic preparation. **Dose.**—1 to 4 grs.
2. **Pilula Gossypii Composita.**—Ext. Gossyp. Cort., Ext. Hydrastis, Ergotin, of each 1 gr. For *congestive dysmenorrhœa*. **Dose.**—1, three or four times a day.

PHARMACOLOGY AND THERAPEUTICS

Internally.—It is largely employed in America as a substitute for ergot, though its effects are not so rapid or reliable.

GRAMINIS CITRATI OLEUM

Oil of Lemon Grass

N.O. *Gramineæ*. (*Ind. and Col. Addendum*)

Syn. B.P.—Indian Oil of Verbena. **Syn. I. V.**—*Gandha Bena tel*, Beng. *Rusa ka tel*, Hind.

Habitat.—India, Eastern and West Indian Colonies.

Source.—The oil distilled from *Andropogon citratus* (*Andropogon Schænanthus*).

Characters.—A dark yellow oil. Odour resembling that of verbena. Sp. gr. 0.895 to 0.905.

Composition.—(1) *Citral*. (2) *Citronellal*, &c.

B.P. Dose.— $\frac{1}{2}$ to 3 ms.

PHARMACOLOGY AND THERAPEUTICS

Externally.—It is a **rubefacient** like oil of cajuput and may be used diluted with a bland oil in **lumbago**, **myalgia**, **rheumatism**, &c. It may be used undiluted in chronic cases. It disguises the smell of iodoform. It is largely employed in perfumery and in adulterating verbena oil which it resembles.

Internally.—As a **stimulant** and a **carminative** it may be used like other aromatic oils. In **cholera** it is said to arrest thirst and to aid the process of reaction.

GRANATI CORTEX

Pomegranate Bark. N.O. *Lythraceæ*

Syn. I. V.—*Dârim gâcher chhâl*, Beng. *Anâr ka chhâl*, Hind.

Habitat.—Southern Europe, Central Asia, cultivated in India.

Source.—The dried bark of the stem and root of *Punica granatum*.

Characters.—In curved or channelled pieces. 2 to 4 in. long, $\frac{1}{2}$ to 1 in. wide. Outer surface of the root-bark rough, yellowish-grey with irregular depressions. Stem-bark smoother, bearing minute lichens. Inner surface yellow, tinged with brown. Inodorous. Taste astringent, slightly bitter.

Composition.—The root-bark contains the most alkaloids, more so in that of the red-flowered and the white-flowered varieties. (1) *Pelletierine* or *Punicine*, a liquid volatile alkaloid. (2) *Isopelletierine* or *isopunicine*. (3) *Methyl-pelletierine*. (4) *Pseudopelletierine*. The first two are active and constitute the medicinal pelletierine, and the last two are inert. (5) *Punico-tannic acid*.

Incompatibles.—Alkalis, metallic salts, lime water, gelatin.

Action.—Astringent, tœniafuge.

OFFICIAL PREPARATIONS

1. **Decoctum Granati Corticis.**—1 in 5 (10 minutes). **B.P. Dose.**— $\frac{1}{2}$ to 2 ozs.

NON-OFFICIAL PREPARATIONS

1. **Pelletierine Sulphas.**—A viscid soluble liquid. *Dose.*—5 to 8 grs. with the same quantity of tannic acid.
2. **Pelletierine Tannas.**—A yellowish amorphous powder insoluble in water. *Dose.*—5 to 8 grs.

PHARMACOLOGY

Internally.—The bark and the rind of the fruit are **astringent**. The bark, especially the root-bark, is also a valuable **anthelmintic** for tape-worm. In large doses it causes vomiting and purging. Pelletierine sulphate being soon absorbed by the stomach cannot kill the parasite in the intestine, but in large doses produces certain constitutional symptoms such as dimness of vision, giddiness, muscular weakness and twitchings, &c. These symptoms do not follow the use of the sulphate when combined with tannic acid.

THERAPEUTICS

Internally.—The decoction of the fresh root-bark is a valuable **tœniafuge**. It should be given every $\frac{1}{2}$ or 1 hour after fasting, or better still after a dose of castor oil and continued even when vomiting takes place. A brisk purgative, such as compound jalap powder should follow its use. Pelletierine salts may be used successfully for the same purpose and with the same precautions. Only fresh salts are reliable as they deteriorate on keeping.

The rind of the fruit is a valuable remedy for **diarrhoea** and **dysentery**. The writer often uses it with good results alone in diarrhoea, and with the rind of mangosteen fruit, *Garcinia mangostina*, and with *kurchi* bark (*Wrightia antidysenterica*) in the form of decoction in dysentery. The fresh juice of the succulent seeds is much used as a **cooling beverage** in febrile and other diseases.

GRINDELIA. *Grindelia*

N.O. Compositæ. (*Ind. and Col. Addendum*)

Habitat.—Australasian and North American Colonies.

Source.—The dried leaves of *Grindelia squarrosa* and *Grindelia robusta*.

Characters.—The leaves of *Grindelia squarrosa* are alternate, pale-green, smooth, coriaceous, brittle, oblanceolate; and at the sessile base the involucre bracts are long with reflexed subulate points. The leaves of *Grindelia robusta* are almost similar, but shorter, and have a cordate amplexicaul base and a serrated margin. Odour balsamic. Taste pungently aromatic, bitter.

Composition.—(1) A Volatile oil. (2) A Resin, allied to saponin. (3) Probably an alkaloid.

OFFICIAL PREPARATION

1. **Extractum Grindeliæ Liquidum.**—1 in 1. By percolation with alcohol (90 p.c.), water, and sodium bicarbonate. **B.P. Dose.**—10 to 20 ms.

NON-OFFICIAL PREPARATIONS

1. **Extractum Grindeliæ.**—Alcoholic. *Dose.*—2 to 3 grs., in pill form with lycopodium.

2. **Tinctura Grindeliæ.**—1 in 8 of alcohol (90 p.c.). Requires a suspending agent, to prevent precipitation of resin. *Dose.*—1 to 2 drs.

3. **Mistura Grindeliæ.**—Ext. Grindeliæ Liquidum 30 ms., Ext. Glycyrrhizæ Liquidum 1 dr., Sp. Chlorof. 5 ms., Mucilage 2 drs., Syrup 30 ms., Water 1 oz.

PHARMACOLOGY

Externally.—It is a local stimulant.

Internally. Stomach.—It locally stimulates the stomach and acts as a mild stomachic, and if continued too long, it may cause gastric uneasiness.

Remote action.—After absorption it slows the heart and respiration, but its chief action is on the bronchial mucous membrane which it stimulates, and on the muscular fibre of the bronchial tubes, which it relaxes. It is therefore an **expectorant** and a **bronchial anti-spasmodic**. In large doses it powerfully depresses the respiratory and cardiac centres, dilates the pupil and causes sleep. The cutaneous sensibility and reflex movements are lessened, and there is incomplete paralysis of the limbs. The oleo-resin is mainly excreted by the kidneys, which it stimulates thus acting as a mild **diuretic**.

THERAPEUTICS

Externally.—A lotion (1 dr. of the liquid extract in 6 ozs. of water) makes a useful dressing for **burns** and **ulcers**, and as an injection in **urethritis** and **leucorrhœa**. In America, cloths steeped in it are applied to the skin in **dermatitis** caused by the poisonous ivy (*Rhus toxicodendron*).

Internally.—Its chief use is in **asthma**, 20 or 30 ms. of the liquid extract given every half or one hour relieve a paroxysm after two, three or four doses. The dried leaves mixed with nitre may be burnt and the fumes inhaled with advantage. It has been found equally serviceable in **spasmodic bronchitis**, **emphysema**, **whooping-cough** and other **spasmodic respiratory troubles**. In full doses it is said to

arrest **chronic pyelitis** and **chronic cystitis**. *Grindelia squarrosa* has also been found useful in **ague**, **neuralgia**, **enlarged spleen**, &c.

GUAIACI LIGNUM

Guaiacum Wood. N.O. *Zygophyllæ*

Habitat.—St. Domingo, Jamaica.

Source.—The heart-wood of *Guaiacum officinale*, or of *Guaiacum sanctum*.

Characters.—Dark greenish-brown, dense, hard, heavier than water. Taste acid. Odour when heated aromatic.

Composition.—(1) A *Resin* (off.). 26 p.c.

Enters into.—Liq. Sarsæ Compositus Conc.

GUAIACI RESINA

Guaiacum Resin

Source.—Obtained from the guaiacum wood.

Characters.—In large masses or sometimes in rounded tears, yellowish-brown to reddish-brown, brittle, breaking with a clean glassy fracture. Thin splinters transparent. Powder greyish, but becomes green by exposure to light and air. *Impurity.*—Colophony (resin). *Solubility.*—About 90 p.c. is soluble in absolute alcohol, chloroform, ether, aromatic spirit of ammonia, and alkaline solutions.

Identifications.—The greenish colour of the masses, the glassy fracture, and the absence of marked odour are characteristic. The student should compare it with aloes, myrrh, benzoin, resin, and scammony, which have no greenish tinge, and have characteristic odours. The powdered guaiacum resin is greyish-green and has a characteristic odour.

Composition.—Complex. Contains several resin acids.—(1) *Guaiaconic*, (2) *Guaiacic*, and (3) *Guaiaretic acids*. (4) *Guaiac Beta Resin*. (5) *Guaiac yellow*.

Incompatibles.—Mineral acids, spirit of nitrous ether.

Action.—Stimulant, diaphoretic, alterative.

B.P. Dose.—5 to 15 grs.

Enters into.—Pil. Hydrarg. Subchlor. Co. and the

OFFICIAL PREPARATIONS

1. **Mistura Guaiaci.**—11 grs. in 1 oz. **B.P. Dose.**— $\frac{1}{2}$ to 1 oz.
2. **Tinctura Guaiaci Ammoniata.**—1 in 5. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.
3. **Trochiscus Guaiaci Resinæ.**—3 grs. in each.

NON-OFFICIAL PREPARATIONS

1. **Tr. Guaiaci, B.P.C.**—Guaiacum 4 ozs., Alcohol (90 p.c.) *q.s.* to 1 pint, by solution. *Dose.*— $\frac{1}{2}$ to 1 dr.

2. **Chelsea Pensioner.**—The original formula has undergone much modification. The following is commonly used:—Pulv. Guaiaci Res. $\frac{1}{2}$ oz., Pulv. Rhei 2 drs., Pulv. Pot. Nitræ 1 oz., Sulphur Sub. 1 oz., Pulv. Sinapsis 1 oz., Mel *q.s.* M. T. Elect. In *chronic rheumatism* and *chronic gout*. *Dose.*—1 to 2 teaspoonfuls night and morning.

PHARMACOLOGY

Internally.—Guaiacum resin having an acrid pungent taste increases the flow of saliva. It produces a sensation of warmth in the throat and in the stomach, and increases the movements and the secretion of the stomach and bowels. In large doses it is a **gastro-intestinal irritant**, causing vomiting and purging. It reflexly stimulates the heart. It stimulates the action of the kidneys, of the skin, and slightly of the liver, and is therefore a mild **diuretic**, **diaphoretic** and **cholagogue**. Some think it is an **emmenagogue** too. According to Garrod, it frequently in gouty subjects produces a copious elimination of uric acid in the form of urates.

THERAPEUTICS

Internally.—Its usefulness is most conspicuous in acute **tonsillitis**, almost ranking with aconite or sodium salicylate. The lozenge, taken several times a day, relieves **follicular pharyngitis**. It is recommended in **lumbago**, **sciatica**, **neuralgic** and **rheumatic dysmenorrhœa**, **amenorrhœa** and **chronic rheumatism**. Sir Alfred Garrod praises it in **subacute** and **chronic gout**. According to him it relieves patients suffering from gouty inflammation of a part, if given when they are not very feverish; and acts as a *prophylactic* if given in the intervals of gouty attacks. As a prophylactic he administers, every morning for years without harm, either 10 or 12 grs. of the powdered resin with or without potassium iodide, washed down with an effervescent draught of citrate of lithium, or else lithium guaiacate 5 grs. in pill twice daily. In many chronic rheumatic affections of the joints Chelsea pensioner is a favourite remedy. In **syphilis** it is entirely valueless.

Prescribing hints.—The powdered resin is best given in cachets, and the ammoniated tincture in milk or sherry, emulsified with mucilage and syrup. Many consider guaiacum mixture to be more effective than the tincture.

GUARANA. U.S.

(Non-Official)

Habitat.—Brazil.

Source.—The seeds of *Paullinia cupana* (*P. sorbilis*), roasted and made into a hard paste with water.

Characters.—In cylindrical pieces.

Composition.—(1) *Guaranine*, a crystalline alkaloid, identical with caffeine. *Dose.*— $\frac{1}{2}$ to 5 grs. or more. (2) Tannin. (3) Gum.

Action.—Nervine tonic. *Dose.*—10 to 60 grs.

NON-OFFICIAL PREPARATIONS

1. **Elixir Guaranæ, B.P.C.**—Guarana 20, Mag. Levis 2·5, Ol. Cinnamom. 0·05, Syrup 10, Alcohol (60 p.c.) *q.s.* to 100. *Dose.*— $\frac{1}{2}$ to 2 drs.

2. **Tinctura Guaranæ.**—1 in 4, with alcohol (60 p.c.). *Dose.*— $\frac{1}{2}$ to 1 dr.

PHARMACOLOGY AND THERAPEUTICS

Guarana contains twice as much caffeine as tea, and five times as much as coffee. It is a valuable remedy for **sick-headache**, but large doses are necessary (30 to 60 grs.). Also used in **diarrhoea** and **dysentery**.

GUMMI INDICUM

Indian Gum. (*Ind. and Col. Addendum*)

Habitat.—India and Eastern Colonies.

Source.—A gummy exudation from the wood of *Anogeissus latifolia*.

Characters.—In vermiform or rounded tears, amber coloured, translucent, with a dull surface. Fracture glassy. **Solubility.**—In water, forming mucilage.

OFFICIAL PREPARATION

1. **Mucilago Gummi Indici.**—Gum 2 ozs., Water 6 ozs. Dissolve.

PHARMACOLOGY AND THERAPEUTICS

In India and Eastern Colonies, Indian gum may be used in making official preparations for which gum acacia is prescribed (*see p. 167*).

GYNOCARDIÆ OLEUM

Gynocardia Oil. N.O. *Bixineæ*

(*Ind. and Col. Addendum*)

Syn. B.P.—Chaulmoogra Oil. **Syn. I. V.**—*Chalmugra tel*, Beng., Hind.

Habitat.—Found in the forests of the Malayan Peninsula and of the lower Himalaya, as far north as Sikkim, and thence as far east as Chittagong and Rangoon.

Source.—The fatty oil expressed from the seeds of *Gynocardia odorata* or of *Gynocardia pruinii*.

Characters.—Brownish-yellow* of varying consistence. Odour characteristic. Taste acid. Liquefies fully at 107.6° F., resolidifying at different temperatures down to 60° F. **Solubility.**—Partly in alcohol (90 p.c.), freely in ether, chloroform, and carbon bisulphide.

Composition.—(1) *Gynocardic acid* 21.7 p.c. is the active principle. (2) *Palmitic acid*, 63 p.c. (3) *Hypogæic acid*, 4 p.c. (4) *Coccinic acid*, 2.3 p.c.

Action.—Alterative.

B.P. Dose.—5 to 10 ms., gradually increased to 30 to 60 ms.

* The oil obtained by cold expression is clear, of a pale sherry colour; and that by hot expression, as seen in the bazaars, is more or less dark, thick, containing a whitish deposit of fatty substances and impurities. The oil expressed from the seeds of *Hydrocarpus Wightiana* is sometimes substituted for chaulmoogra oil.

OFFICIAL PREPARATION

1. **Unguentum Gynocardiae**.—Oil 50 grs., Hard Paraffin 200 grs., Soft Paraffin 250 grs. Melt and mix.

PHARMACOLOGY

Externally.—Chaulmoogra oil when rubbed into the skin stimulates the local circulation and the local nerves. If rubbed too long or every day for some time, it is a **rubefacient**.

Internally.—The effect of chaulmoogra oil depends upon its active ingredient *gynocardic acid*. In the beginning, with many it causes loss of appetite, nausea, and even vomiting and purging; but the stomach becomes soon habituated to its use. After absorption, it acts as an **alterative**, probably by slowly modifying the local nutrition of the morbid lesions and thereby inducing healthier changes in them, and also by improving the general nutrition of the body.

THERAPEUTICS

Chaulmoogra oil has long been known and used in the East as a remedy for leprosy and other skin diseases, but within the past twenty years, the knowledge of it has spread to the West and its value has been admitted in **leprosy, eczema, lupus, scrofula, phthisis, rheumatism** and **gout**. The remedy is employed both externally and internally, and the patient taking it must live generously as the weak and the underfed are liable to gastric derangement. To test its efficacy in leprosy, a Commission was appointed in 1890-91, and from the evidence recorded, it appears to be the best **palliative** and superior to gurgun oil (oil of *dipterocarpus*). The writer considers it more effective in recent cases of leprosy than in old ones, aborting the disease after six months to one year's treatment. He rubs the oil into the diseased patches and gives it internally, gradually increasing the dose to $1\frac{1}{2}$ drs. He finds better results if it is given with small doses of arsenic, and if the external application is a mixture of equal parts of chaulmoogra oil and *neem* oil (oil of *Melia azadirachta*, see p. 262). Where the stomach cannot bear the oil, *gynocardic acid* in $\frac{1}{2}$ to 3 grs. or *magnesium gynocardate* in 1 to 3 grs., may be given with the same results. As a remedy for other diseases, it has not proved a success except in **chronic eczema**, as a stimulating local application.

Prescribing hints.—Chaulmoogra oil should be given after food in capsules (5 ms. in each), floating on warm milk or in sweetened emulsion to which a few drops of lemon oil have been added. The after-taste is very well removed by the sucking of a fresh-cut lemon. In India the oil is fluid, but in England it is solid. The dose should be gradually increased, and its administration should be suspended if the stomach becomes irritated. The writer has increased the dose gradually to 90 ms. without causing gastric disorder.

HÆMATOXYLI LIGNUMLogwood. N.O. *Leguminosæ***Habitat.**—Campeachy, Honduras, Jamaica.**Source.**—The heart wood of *Hæmatoxylon campechianum*.**Characters.**—Imported in logs or chips. Logs heavy, hard, orange to purplish-red externally, and reddish-brown internally. Chips or coarse powder should be unfermented, and have a somewhat agreeable odour, and sweetish astringent taste. When chewed it colours the saliva pink.**Identification.**—It resembles red sandalwood, which is more dense and less astringent.**Incompatibles.**—Mineral acids, lime water, tartar emetic. Metallic salts give a blue colour.**Composition.**—(1) *Tannic acid*. (2) *Hæmatoxylin*, a colouring principle in colourless crystals which on exposure to light becomes red.**Action.**—Astringent.

OFFICIAL PREPARATION

1. **Decoctum Hæmatoxyli.**—1 in 20. **B.P. Dose.**— $\frac{1}{2}$ to 2 ozs. No iron vessel should be used for boiling.

NON-OFFICIAL PREPARATION

1. **Ext. Hæmatoxyli Liquidum, B.P.C.**—*Dose.*— $\frac{1}{2}$ to 2 drs.

PHARMACOLOGY AND THERAPEUTICS

On account of its tannic acid, logwood is a valuable **astringent**, and is used in those cases where tannin is indicated. It is generally given in **diarrhoea** of both adults and children in combination with opium and other astringents. Rarely it is prescribed alone. It colours both urine and faeces deep red. This is one of the objections to its use, as mothers object to the staining of the children's diapers. The decoction may be used as an injection in **leucorrhœa**. Hæmatoxylin dissolved in alcohol is used for staining histological specimens.

HAMAMELIDIS CORTEXHamamelis Bark. N.O. *Hamameliaceæ***Syn.**—Witch-hazel bark.**Habitat.**—The United States.**Source.**—The dried bark of *Hamamelis virginiana*.**Characters.**—In curved pieces, $\frac{1}{16}$ in. thick, 2 to 8 in. long; sometimes covered with a scaly, silver-grey outer bark, marked with lenticels; but often free from outer bark, then exhibiting a smooth, reddish-brown outer surface; inner surface reddish-pink, striated longitudinally. Taste astringent. Inodorous.**Composition.**—(1) *Tannic acid* 8 p.c. (2) *A Volatile Principle* not isolated. (3) *Colouring matter*.

OFFICIAL PREPARATION

1. **Tinctura Hamamelidis.**—1 in 10. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.

NON-OFFICIAL PREPARATION

1. **Hamamelin.** *Syn.*—*Hamamelidin.*—A powdered extract. *Dose.*—1 to 5 grs. in pill. A suppository in 1 to 3 grs. with cocoa-butter.

HAMAMELIDIS FOLIA

Hamamelis Leaves

Source.—The leaves fresh and dried of *Hamamelis virginiana*.

Characters.—Broadly oval, 3 to 6 in. long, dark-green or brownish-green above, pale below; apex obtuse; base oblique, cordate and shortly petiolate; margin sinuate; veins pinnate and prominent on the under surface, which is furnished with stellate hairs. Taste astringent, slightly bitter. No odour.

OFFICIAL PREPARATIONS

1. **Extractum Hamamelidis Liquidum.**—1 in 1. **B.P. Dose.**—5 to 15 ms.
 2. **Liquor Hamamelidis.**—1 in 1. **B.P. Dose.**—5 to 15 ms.
 3. **Unguentum Hamamelidis.**—1 in 10.

N.B.—**Hazeline** and **Pond's Extract** are also distillates of fresh leaves and twigs. *Dose* of the former is $\frac{1}{2}$ to 3 drs., and of the latter 10 drops hourly.

PHARMACOLOGY

Witch-hazel is a **local** and a **remote astringent** and **hæmostatic**, but how it acts we do not know, for though the bark contains tannic acid, yet liquor hamamelidis, which is a distillate and consequently contains no tannin, is as active as the tincture prepared from the bark, Dr. Hector Guy investigated its pharmacology but found that it is neither a tonic nor has any action on the heart, blood-vessels or veins. Drs. Wood and Marshall also could not obtain any physiological effects. It is not a poison, but large doses sometimes cause headache.

THERAPEUTICS

Externally.—As a local astringent or hæmostatic it has been used in various ways and in various affections. A lotion (tincture or liquor 1 in 4 to 10 of water) is a valuable application to **bruises, wounds** and **sores**. It may be used as a gargle in **sore throat**, **bleeding** from the **gums**, **ulcerative stomatitis**, or as an injection in **gonorrhœa**, **vesical hæmorrhage**, **nasal catarrh**, **epistaxis**, &c. Hamamelis is a most valuable remedy in internal and external **piles**. Equal parts of hazeline and glycerin soaked in cotton and applied to the **ulcerated os** with congested cervix, subdue the inflammation and heal the ulcer. Its application to **varicoceles** and **varicose veins** has apparently given good results.

Internally.—In all forms of **passive hæmorrhage** hamamelis has been found useful. **Epistaxis**, **hæmoptysis**, **hæmatemesis**, **hæmaturia**, **menorrhagia** and especially **hæmorrhoidal bleeding** yield to it. It relieves the pain of **dysmenorrhœa**, and according to Brunton it is more effective in **hæmoptysis** than either ergot or digitalis, but certainly it cannot rank with calcium chloride. The writer has obtained decidedly good results in dysentery. It arrests hæmorrhage and to some extent also the discharges of that disease. Its efficacy is most marked in those cases in which the vascular tone is lost, as for instance in dysentery attacking persons suffering from chronic malarial fever and hypertrophy of the spleen. Dr. Preston praises it in **phlegmasia dolens**. Many local hæmorrhages are more efficiently checked when the local application of hamamelis is supplemented by its internal administration.

Prescribing hints.—The mode of administration of hamamelis in piles requires a fuller description. In the case of external or externo-internal piles, they should be bathed with cold water *and not wiped*, after each defecation, so as to remove all offending septic particles. A pledget of cotton-wool (or better still prepared sheep's wool) steeped in the ointment or solution, should then be inserted into the rectum until only one-half remains outside, so that the sphincter of the anus; may grip it in the centre. Thus applied it serves two ends, the upper part of the pledget keeps the medicine applied to piles within the anus; while the lower part of it not only does the same outside the anus, but maintains a gentle pressure over them. In the case of internal piles, the ointment may be introduced by an ointment introducer or the solution injected by a glycerin syringe. Hamamelin suppositories have not been found so successful. If this treatment is persevered in for several months, it not only permanently relieves but cures piles that are not very large.

HEMIDESMI RADIX

Hemidesmus Root. N.O. *Asclepiadaceæ*

Syn.—Indian Sarsaparilla. **Syn. I. V.**—*Anantamul*, Beng. *Magrabu*, Hind.

Habitat.—India.

Source.—The dried root of *Hemidesmus Indicus*.

Characters.—Long, rigid, cylindrical, tortuous, longitudinally furrowed, $\frac{1}{2}$ in, thick, dark brown. Cork frequently separated and transversely fissured. Odour fragrant. Taste sweetish.

Identification.—It somewhat resembles ipecacuanha, sarsaparilla, and senega. Its rigidity, longitudinal furrow, and incomplete transverse fissure will distinguish it from either of the above.

Composition.—(1) *Hemidesmine*. (2) *Tannin*. (3) *Starch*, &c.

OFFICIAL PREPARATION

1. **Syrupus Hemidesmi.**—1 in 8 by measure. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.

PHARMACOLOGY AND THERAPEUTICS

The dry root has no action. The fresh root is said to possess alterative, tonic and diaphoretic properties, and is often prescribed by the unqualified medical practitioners of this country in chronic rheumatism, syphilis and many cutaneous diseases, &c. The writer has found the dry root almost inert. It is strange that it is yet retained in the B.P.

HIRUDO. Leeches

N.O. *Annelida*

Syn. I. V.—*Jonk*, Beng., Hind.

Habitat.—Spain, Italy, France, Hungary.

In India there are many distinct species, which are gathered from marshes and tanks.

Source.—Two species are official:—(1) *Sanguisuga medicinalis*, the Speckled Leech, whose belly is greenish-yellow and spotted black; (2) *Sanguisuga officinalis*, the Green Leech, whose belly is olive-green and not spotted.

HIRUDO AUSTRALIS. Australian Leech

(Ind. and Col. Addendum)

Source.—*Hirudo quinquestrata*. The five-striped or Australian leech, whose dorsal surface is greenish-yellow-brown with five longitudinal stripes, and ventral surface greenish-yellow not spotted.

PHARMACOLOGY

Each leech draws from 1 to 2 drs. of blood, and by subsequent fomentation as much again or more may be abstracted. Its anterior extremity has a sucking disc with a triradiate mouth furnished with sharp teeth, which saw through the skin. The effect of leeching is both local and general depletion. The secretion from the pharynx of the leech prevents coagulation of the blood. For this reason it is sometimes difficult to stop the bleeding from leech bites. The extract also prevents coagulation of the blood, arrests putrefaction and stimulates both leucocytosis and phagocytosis.

THERAPEUTICS

The tendency of the present day is not to abstract blood. But the opinion is gaining ground that by the absolute rejection of leeching, wet-cupping or venesection, a valuable remedy is lost to therapeutics. Leeches are usually applied over deep-seated structures or organs to relieve congestion or pain as in pleurisy, pneumonia, pericarditis,

myocarditis, hepatitis, meningitis, cerebritis, ovaritis, pelvic cellulitis, metritis, orchitis, tonsillitis, laryngitis, otitis, arthritis, &c. As leech extract prevents coagulation of blood, it has been suggested as an injection in **thrombosis** or as an addition to blood before transfusion.

Mode of application and caution.—(1) A fresh, unused, healthy leech only should be used, for if it has once been applied to a septic surface, it may convey infection.

(2) A prominent part that will admit of pressure in case of excessive hæmorrhage, is to be selected. It should then be thoroughly cleaned and dried, and afterwards washed with milk to remove any unpleasant smell of soap or disinfectants.

(3) The leech must not be touched by the fingers of the nurse or attendant. Place it inside a pill-box or wineglass, which is then inverted over the selected spot until the leech has attached itself to the skin; but sometimes it refuses to bite even then. If this happens, a little cream or sugar may be applied to the spot, or the part may be scratched with the point of a needle.

(4) A leech glass or a glass syringe through which its head alone can penetrate, should be used for its application to tonsils, os uteri, or rectum.

(5) If it is intended that it should bite a particular spot, a perforated piece of paper may first be spread over the skin, keeping open the definite spot for fastening.

(6) It should not be pulled off but allowed to fall off of its own accord. If it does not, it can easily be dislodged by sprinkling a little salt over it.

(7) In case it crawls down the œsophagus or up the rectum, the patient must immediately be made to swallow a copious draught of salt water, or else it must be injected into the rectum, as the case may require. This usually suffices to effect dislodgment.

(8) If the bleeding is not checked by a small ball of cotton-wool and pressure, a pellet of cotton-wool soaked in collodion or in strong solution of iron perchloride, a fragment of matico-leaf, or the stick of silver nitrate thrust within the bite will help to arrest it. If all these measures fail, a needle passed through the bite and a silk thread wound round it in the shape of a figure of 8 is sure to stop it.

(9) As the marks of leech-bites are indelible such parts only should be selected for application as will not be exposed to view. As, for instance, in otitis on the mastoid process, and in ophthalmia high up on the temple.

(10) Leeches should be applied with great caution to the old, the enfeebled, and to children. In the case of children they should not be applied at night, lest a dangerous hæmorrhage should pass unnoticed in the darkness.

(11) It must be remembered that the smoke of tobacco or any other strong smell in a room often prevents the leech from biting.

HYDRARGYRUM

Mercury. Hg

Source.—A metal obtained from native mercuric sulphide (cinnabar).

Characters.—Silver-white liquid, easily divisible into globules. Volatilizes at 662° F. and solidifies at - 40° F. **Impurities.**—Lead, tin, and other metals.

OFFICIAL PREPARATIONS

1. **Emplastrum Hydrargyri.**—1 in 3. A bluish solid.
2. **Emplastrum Ammoniaci cum Hydrargyro.**—1 in 5. A dirty-blue solid. Stimulant and resolvent in *glandular enlargements, buboes, nodes, lupus*, and *sycosis*, &c.
3. **Hydrargyrum cum Creta.** *Syn.*—*Grey Powder.*—1 in 3. A greyish-blue powder. *Impurity.*—Mercuric oxide. *Alterative.* Useful in children's *diarrhœa* with pale offensive, green, clay-coloured, or curdy stools, *dyspepsia*, *jaundice*, *tonsillitis*, &c., in $\frac{1}{4}$ to $\frac{1}{2}$ gr. 3 or 4 times a day. **B.P. Dose.**—1 to 5 grs. ; $\frac{1}{4}$ to $\frac{1}{2}$ gr. for a child one year old.
4. **Linimentum Hydrargyri.**—1 oint. in 3, or 1 of Hg. in 6. A stimulating absorbent liniment for chronic enlargement of joints. Produces salivation when applied to the armpit on lint. More irritating than plaster or ointment.
5. **Pilula Hydrargyri.** *Syn. B.P.*—*Blue Pill.*—1 in 3. Purgative. In *biliousness* or for general action of mercury with opium. **B.P. Dose.**—4 to 8 grs.
6. **Unguentum Hydrargyri.** *Syn.*—*Blue Ointment.*—1 in 2. For general action by absorption.
7. **Unguentum Hydrargyri Compositum.**—*Syn.*—*Scott's Ointment or Dressing.*—1 Hg. in 5. Resolvent. In chronic *indurated joints, infiltrations*, and *glandular enlargements*.

NON-OFFICIAL PREPARATIONS

1. **Lanolinum Hydrargyri.**—Mercury 100, Lanoline 200, Mercurial Ointment 5, Mutton Suet 50. More rapidly absorbed. In *syphilis* as an inunction.
2. **Oleum Cinereum.** *Syn.*—*Grey Oil.*—Mercury 39, Mercurial Ointment 2, Vaseline 59. *Dose.*—1 to 2 ms. ; hypodermically in *syphilis*. Not safe. May cause cellulitis.
3. **Mercury Plaster Mull (Unna).**—Mercury 1 gr. to each square inch.
4. **Suppositoria Hydrargyri.**—5 grs. of oint. in each. To produce general action without interfering with digestion.
5. **Hyrgol.** *Syn.*—*Hydrargyrum Colloidale.*—Soluble in water ; said to contain nearly 20 p.c. of mercury. A 10 p.c. ointment useful in *epididymitis*.
6. **Mercuriol.** *Syn.*—*Mercuramalgam.*—An amalgam of mercury aluminium and magnesium. An amorphous powder, containing 40 p.c. of

mercury, which volatilizes under the influence of heat and moisture. Carried as a sachet, next the skin, in *syphilitic affections*.

7. **Mercuriol.**—A combination of mercury and nuclein, used as an injection ($\frac{1}{2}$ to 2 p.c.) in *gonorrhœa*.

8. **Unguentum Hydrargyri Mitius, B.P.C. 1901.** *Syn.*—*Blue Uction*, *Ung. Hydrargyri Dilutum B.P.C. 1907.*—Ung. Hydrarg. 1, Lard 2. Mix. Useful for destroying *Pediculus pubis*.

HYDRARGYRI IODIDUM RUBRUM

Mercuric Iodide. HgI_2

Syn. B.P.—Biniodide of Mercury.

Source and Characters.—A crystalline vermilion powder, obtained by the interaction of mercuric chloride with potassium iodide. *Solubility.*—Insoluble in water, but freely in solution of potassium iodide and ether.

Action.—Antiseptic, irritant, vesicant. Alterative, deobstruent, and irritant poison in large doses.

B.P. Dose.— $\frac{1}{2}$ to $\frac{1}{16}$ gr. in *pillules*, prepared with milk-sugar and glucose; or in mixtures of Pot. iodide.

OFFICIAL PREPARATIONS

1. **Liquor Arsenii et Hydrargyri Iodidi.**—*Donovan's Solution.* See p. 172.
2. **Unguentum Hydrargyri Iodidi Rubri.**—1 in 25. Rubefacient, absorbent. *Syphilitic warts, nodes, lupus, and bronchocle.*

NON-OFFICIAL PREPARATIONS

1. **Injectio Hydrarg. Iod. Rub. Hypodermica.**—Mercuric Iodide 1 gr., Sodium Iodide *q.s.*, Water to 64 ms. *Dose.*—2 to 6 ms.
2. **Injectio Hyd. Iodidi** (pro Vagina).—1 in 10,000. Mercuric Chloride 8 grs., Pot. Iodide 5 grs., Water to 1 oz., 1 dr. to 1 pint of water.
3. **Hydrarg. et Potassii Iodidi.**—Yellow acicular crystals. *Dose.*— $\frac{1}{16}$ to $\frac{1}{4}$ gr.
4. **Hydrargyri Iodidum Viride, B.P. 1867.**—A dull green powder decomposing into Hg. and mercuric iodide upon exposure to light. **Action.**—Same as mercuric iodide, but more irritant. *Dose.*— $\frac{1}{2}$ to 1 gr.
5. **Hydriodol.** *Syn.*—*Cypridol.*—Contains 1 p.c. of Iodide in sterilized oil. For hypodermic injection. *Dose.*—3 to 6 ms.
6. **Hydrarg. Salicyl-arsenas.** *Syn.*—*Enesol.*—White powder containing 38 p.c. mercury. Solution painless on injection.

HYDRARGYRI OLEAS. Mercuric Oleate

Source and Characters.—A light greyish unctuous substance obtained by the interaction of mercuric chloride and sodium oleate.

Action.—The same as liniment or ointment, but absorbed more rapidly. Kills pediculi.

OFFICIAL PREPARATION

1. **Unguentum Hydrargyri Oleatis.**—1 in 4.

HYDRARGYRI OXIDUM FLAVUM

Yellow Mercuric Oxide. HgO

Source and Characters.—A yellow non-crystalline powder obtained by the interaction of mercuric chloride and sodium hydroxide.
 $\text{HgCl}_2 + 2\text{NaHO} = \text{HgO} + 2\text{NaCl} + \text{H}_2\text{O}$. Insoluble in water.

OFFICIAL PREPARATION

1. **Unguentum Hydrargyri Oxidi Flavi.**—1 in 50. **Action.**—Parasiticide and alterative. Valuable in *tinea tarsi*, *corneal ulcer*, obstinate *conjunctivitis* and the *eczema of the eyelids*. It is a substitute for **Golden Ointment**.

HYDRARGYRI OXIDUM RUBRUM

Red Mercuric Oxide. HgO

Source and Characters.—An orange-red powder obtained by heating mercurous nitrate until acid vapours cease to be evolved. Insoluble in water.

OFFICIAL PREPARATION

1. **Unguentum Hydrargyri Oxidum Rubri.** *Syn. B.P.*—*Red Precipitate Ointment*.—1 in 10. Locally stimulant and absorbent. Diluted in *ophthalmia* like yellow mercuric ointment. In syphilitic sores and skin diseases.

NON-OFFICIAL PREPARATIONS

1. **Hydrargyri Cyanidum.**—White or colourless crystals, obtained by boiling red mercuric oxide with Prussian blue. A powerful antiseptic. As a lotion to *syphilitic sores*, and in pill $\frac{1}{10}$ to $\frac{1}{12}$ gr. In *diphtheria* $\frac{1}{2}$ to $\frac{1}{4}$ gr. with Tr. aconite 1 m. frequently. *Dose.*— $\frac{1}{20}$ to $\frac{1}{4}$ gr.

2. **Mercurio-Zinc Cyanide.**—A white powder recommended by Lord Lister as an unirritating antiseptic to make gauze, and ointment for *eczema*.

HYDRARGYRI PERCHLORIDUM

Mercuric Chloride. HgCl_2

Syn. B.P.—Bichloride of Mercury, Corrosive Sublimate, Perchloride of Mercury.

Source.—A salt obtained as a sublimate by heating a mixture of mercuric sulphate, sodium chloride, and a little black oxide of manganese,
 $\text{HgSO}_4 + 2\text{NaCl} + \text{MnO}_2 = \text{HgCl}_2 + \text{Na}_2\text{SO}_4 + \text{MnO}_2$.

Characters.—Heavy colourless masses of prismatic crystals. *Solubility.*—1 in 16 of cold, 1 in 2 of boiling water; 1 in 3 of alcohol (90 p.c.), 1 in 4 of ether; 1 in 2 of cold glycerin on trituration. *Impurities.*—Fixed salts, not volatilizing.

Incompatibles.—Alkalis and their carbonates, potassium iodide, lime water, tartar emetic, silver nitrate, albumen, lead acetate, soaps, decoction of bark.

N.B.—Perchloride of mercury decomposes even in distilled water, calomel being deposited. If organic substances are present, the change takes place more rapidly. Ordinary well water is therefore not a good vehicle with which to prepare solutions of the perchloride. The addition however of some free acid—such as ordinary vinegar (1 in 125) or tartaric acid—will prevent this decomposition.

Action.—Antiseptic, disinfectant, parasiticide, alterative, antisyphilitic. A powerfully irritant poison.

B.P. Dose.— $\frac{1}{2}$ to $\frac{1}{16}$ gr. in solution. Hypodermically with sodium chloride.

OFFICIAL PREPARATIONS

1. **Liquor Hydrargyri Perchloridi.**— $\frac{1}{2}$ gr. in 1 oz. A colourless solution, each drachm containing $\frac{1}{16}$ gr. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr. diluted.

2. **Lotio Hydrargyri Flava.** *Syn. B.P.*—*Yellow Wash.*—Colour due to yellow oxide. Resembles yellow oxide ointment in action.

NON-OFFICIAL PREPARATIONS

1. **Corrosive Sublimate Pastils or Discs.**—Containing $8\frac{1}{2}$ grs. of mercuric chloride with the same weight of sodium chloride, coloured violet. 1 disc in 1 pint of water is equal to 1 in 1000.

2. **Sublimate Wood-Wool or Wool.**— $\frac{1}{2}$ p.c. of Corrosive Sublimate.

3. **Sal Alembroth.** *Syn.*—*Ammonio-mercuric Chloride.*—Prepared by interaction of ammonium chloride with mercuric chloride. Soluble 2 in 1 of water. **Alembroth Gauze.**—1 p.c. Damped with carbolic lotion before use as a dressing. **Alembroth Wool.**—2 p.c. Tinted blue. **Hypodermic Injection.**— $\frac{1}{2}$ gr. in water, as an intra-muscular injection into buttocks for syphilis once or twice a week.

4. **Hydrargyri Carbolas.**—Colourless crystals or white powder. In secondary syphilis, especially syphilitic psoriasis and tubercular or macular eruptions. *Dose.*— $\frac{1}{2}$ to $\frac{1}{8}$ gr. in Pill, 3 or 4 times a day.

5. **Glutinopeptonate of Corrosive Sublimate.**—Soluble silky scales. 4 grms. in 100 c.c. of water make a 1 p.c. mercurial solution. One Pravaz syringe-ful every day hypodermically in syphilis. Abscesses do not follow and no chance of relapse after four weeks.

HYDRARGYRI SUBCHLORIDUM

Mercurous Chloride. Hg_2Cl_2

Syn. B.P.—Calomel, Hydrargyri Chloridum, Subchloride of Mercury.

Source.—A salt obtained as a sublimate when a mixture of mercurous sulphate and sodium chloride is heated. $Hg_2SO_4 + 2NaCl = Hg_2Cl_2 + Na_2SO_4$.

Characters.—A dull white heavy nearly tasteless powder. *Solubility.*—Insoluble in water, alcohol (90 p.c.), or ether. Volatilized by heat. *Impurities.*—Mercuric chloride soluble in water, and other chlorides.

Test for impurity.—Take a clean knife, put on it a drop of water and add a few grains of the suspected calomel. After the lapse of a minute wash the blade, when there should be no dark stain. If a black spot of magnetic oxide forms, that shows the presence of perchloride.

Action.—Alterative, purgative, and diuretic.

B.P. Dose.— $\frac{1}{4}$ to 5 grs. ; 1 gr. for a child 1 year old.

OFFICIAL PREPARATIONS

1. **Lotio Hydrargyri Nigra.** *Syn. B.P.—Black Wash.*—3 grs. to 1 oz. The black precipitate is Hg_2O . A stimulating alterative lotion to *syphilitic sores*.

2. **Pilula Hydrargyri Subchloridi Composita.** *Syn.—Compound Calomel Pill, Plummer's Pill.*—1 in $4\frac{1}{2}$. An orange-coloured mass. **B.P. Dose.**—4 to 8 grs. Alterative and feeble cathartic.

3. **Unguentum Hydrargyri Subchloridi.** *Syn.—Calomel Ointment.*—1 in 10. Rarely used. Relieves the itching of eczematous eruptions about the anus and genitals. Salivation rare.

NON-OFFICIAL PREPARATIONS

1. **Calomel Cream, L.L.**—Calomel 10 grs., Vasoline to 1 oz.

2. **Pulvis Basilicus.**—Calomel 3, Scammony 3, Pot. Tartras Acid 3, Jalap 1, Ginger 1, Pulv. Antimonial. 1. *Dose.*—For a child of 2 years, 4 grs. ; of 6 years and upwards, 8 grs.

HYDRARGYRUM AMMONIATUM

Ammoniated Mercury. NH_2HgCl

Syn. B.P.—Ammonio-Chloride of Mercury, Mercuric Ammonium Chloride, White Precipitate.

White powder. Insecticide. Not used internally.

OFFICIAL PREPARATION

1. **Unguentum Hydrargyri Ammoniaci.** *Syn.—White Precipitate Ointment.*—1 in 10. Stimulant and alterative in chronic parasitic skin diseases as *scabies, ringworm, impetigo, &c.*, and *destroys pediculi*.

LIQUOR HYDRARGYRI NITRATIS ACIDUS

Acid Solution of Mercuric Nitrate

Source and Characters.—A colourless solution of mercury in nitric acid and water. *Impurity.*—Mercurous nitrate.

Action.—Antiseptic, caustic. To destroy *syphilitic warts, tubercles, ulcers, cancerous growths*, and *lupus*; care being taken that surrounding healthy tissues are not touched.

Gargle.—1 to 2 ms. in 1 oz. of water.

Gonorrhoeal injection.—1 m. in 2 ozs. of water.

OFFICIAL PREPARATIONS

1. **Unguentum Hydrargyri Nitratis.** *Syn.—Citrine Ointment.*—1 in $16\frac{1}{2}$. Pale lemon colour. Great care and skill are necessary in its preparation.

Dispensing hints.—Diluted with lard becomes leaden coloured, but less

with spermaceti and least with paraffin ointments. **Action.**—Stimulant, alterative. In *tinea tarsi* with 7 parts of vaseline. *Aborts willows and boils.* **Incompatibles.**—Camphor, essential oils, lard, &c.

2. **Unguentum Hydrargyri Nitratis Dilutum.**—1 in 5. A stimulant and alterative application to *scaly eczema*. Diluted with glycerin and brushed inside the nostrils cures *inveterate ozæna*.

NON-OFFICIAL PREPARATION

1. **Unguentum Metallorum.**—Is a mixture of oxide of zinc, diluted with nitrate of mercury and acetate of lead ointments in equal parts. Largely used in *chronic eczema*.

ADDITIONAL NON-OFFICIAL PREPARATIONS OF MERCURY

1. **Hydrargyri Benzoas.**—A white crystalline powder. For hypodermic injection in solution which should be prepared fresh. Hydrarg. Benzoas 5 grs., Sodium Chloride $1\frac{1}{2}$ grs., Water 10 drs.; one Pravaz syringeful daily. *Dose.*— $\frac{1}{16}$ to $\frac{1}{8}$ gr.

2. **Mercuric Ethylene-diamine Sulphate.** *Syn.*—*Sublamine.*—Contains 43 p.c. of mercury. Used as a lotion in the strength of 1 in 1000, an admirable disinfectant, but *very poisonous*.

3. **Hydrargyri Formamidum.**—1 p.c. solution for hypodermic injection from $\frac{1}{2}$ to 1 Pravaz syringeful. Not so successful.

4. **Hydrargyri Gallas.**—Dark-green insoluble powder, being more stable and rapidly absorbed. *Dose.*— $\frac{1}{2}$ to 1 gr. in *primary and secondary syphilis*.

5. **Hydrargyri Lactas.**—Very soluble and non-irritant. *Dose.*— $\frac{1}{4}$ gr. in 15 ms. of water (hypodermically).

6. **Hydrargyri Naphthol-acetas.**—An insoluble white powder. *Dose.*— $\frac{1}{2}$ to 1 gr. In syphilis as intra-muscular injection. Not so successful.

7. **Hydrargyri Salicylas.**—A white powder slightly soluble in water. Powerful antiseptic and antisyphilitic. For *syphilitic sores*, as ointment or dusting powder. Corrosive sublimate 1, Sod. Salicylas 2, Water 1000, form a good lotion for external application.

8. **Hydrargyri Silico-Fluoridum.**—A colourless soluble salt used as a substitute for sublimate, but less irritating and less poisonous.

9. **Hydrargyri Soziodol.**—A pale yellow powder, soluble in solution of sodium chloride. Hypodermically in 1 gr. doses. Sprinkled over *chancres* and *syphilitic sores* (1 in 15).

10. **Hydrargyri Succinimidum.**—A white silky powder soluble in water. Highly recommended for hypodermic injections. A Pravaz syringeful of 2 p.c. solution into the buttock is the usual dose.

11. **Hydrargyri et Sodii Disulphocarbolas.** *Syn.*—*Hermophenyl.*—Contains 40 p.c. of mercury. Antisyphilitic. *Dose.*— $\frac{1}{2}$ gr. in 1 dr. of water (hypodermically).

12. **Hydrargyri Tannas.**—A green tasteless powder decomposed by weak alkalis setting free globules of mercury. Rapidly absorbed from the intestines without the disagreeable symptoms of mercurials, and producing best results in syphilis. *Dose.*—1 to 2 grs. in pill.

13. **Hydrargyri Thymolacetas.**—A white crystalline insoluble powder, produced by mixing acetate of mercury and thymol. Internally in $\frac{1}{2}$ to $1\frac{1}{4}$ grs.; and subcutaneously with liquid paraffin 1 in 10 into the muscles. Injections are stated to be free from the danger of abscesses.

PHARMACOLOGY OF MERCURY AND ITS SALTS

Externally.—Metallic mercury and its salts are **absorbed** by the unbroken skin and may be administered either as an inunction or by fumigation. They enter easily through the hair and sebaceous follicles as an oxide or a chloride in combination with the fatty acids of the sebaceous glands. But on the denuded skin and mucous membranes, they produce certain **definite** actions which are given below:—(1) All mercurials are **antiseptic** and **disinfectant**; more especially the corrosive sublimate, which, in dilutions of 1 in 500,000, prevents the growth of, and of 1 in 25,000 destroys, ordinary bacilli. The German Plague Commission at Bombay have proved that a 1 p.c. solution of sublimate kills the plague bacillus immediately. Moreover many of them, such as the ammoniate, nitrate, perchloride, oleate and oxide destroy animal parasites, hence they are **parasitocides**. (2) Weak solutions of corrosive sublimate ($\frac{1}{4}$ to $\frac{1}{2}$ gr. in 1 oz.), mercurous and many mercuric ointments are **antiphlogistic**, **astringent**, **stimulant** and **resolvent**. (3) Stronger solutions, as of the acid nitrate and perchloride, cause **inflammation** and the concentrated ones **sloughing**.

Internally.—After absorption all mercurial salts have practically the same action, but their local effects vary much in the same way as mentioned in the last paragraph.

Gastro-intestinal tract.—Mercurial salts affect the mouth, gums and salivary glands causing **salivation** and **stomatitis**. This is not the result of direct local action but takes place during the process of excretion by the salivary glands. In the **stomach** they are converted into a complex albuminate containing albumen, sodium chloride and chlorine, which is insoluble at first, but becomes soluble in the excess of albumen or sodium chloride that exists in the stomach, and is then easily absorbed. In the duodenum and upper part of the small intestine, metallic mercury, such as grey powder, blue pill, and calomel **increase the glandular secretions** and **peristalsis**. The intestinal contents are, as the result of this action, hurried on so rapidly that the bile is not reabsorbed as happens normally, consequently the stools are **dark-green** (calomel motions). Hence mercurial salts are **purgatives**. The purgative action is greatly helped by salines. If the doses are insufficient, or sometimes from idiosyncrasy, mercury may be absorbed producing constitutional symptoms, but it is afterwards re-excreted into the bowel as a sulphide. Mercurials arrest **putrefactive changes** in the duodenum and intestine, thereby checking flatulence. As the result of the arrest of putrefactive changes, biliverdin passes unchanged, and no indol is formed. Hence calomel stools are not only grass-green but they are singularly free from putrefactive odour.

Liver.—It is a mistake to say that mercurials increase the amount of bile formed by the liver, though the perchloride may possibly do

so to some extent. Metallic mercury and calomel increase the evacuation of bile by checking its re-absorption in the way already explained and at the same time they stimulate the gall-bladder and bile-ducts. Hence they are reckoned as **indirect cholagogues** (see p. 131).

Blood.—The soluble complex mercurial albuminate freely enters the blood from the stomach and the intestines; and on entering, it is decomposed by oxygen and albumen, forming an **oxyalbuminate**. In *minute and continued doses* mercuric chloride not only increases the **number of red corpuscles**, but increases their **hæmoglobin**, and thus adds a little to the body weight. In this sense it may be considered as a **tonic**. In *large doses* it causes **anæmia**; but how far these actions are due to the improvement or impairment of digestion, or to its action on the blood itself, is not yet known. It arrests the movements of the leucocytes.

Kidneys.—Calomel or sometimes blue pill, in 3 to 5 gr. doses, occasionally acts as a **diuretic** in cardiac dropsy; but it must be used with caution if the kidneys are diseased. The combination with squill and digitalis increases their diuretic action.

Elimination.—Mercury is slowly eliminated by the urine, bile, milk, sweat, saliva; this elimination is especially slow if the kidneys are diseased. It is excreted with the faeces as a sulphide. It accumulates in the body, and can be detected in every organ, but largely in the liver, and the cancellous tissue of the bones. During its excretion by the saliva it affects the salivary glands, largely increasing the **salivary secretion**, by acting either on their secreting cells or the terminal ends of the nerves in them (see p. 122).

Specific action.—Mercury is a specific for syphilis, especially in the primary and secondary stages. This is probably due to its acting as a parasiticide for *Spirochæta pallida*, the organism which is the cause of this disease.

Tolerance.—Age, sex and idiosyncrasy greatly modify the action of mercurials. Children as a rule bear mercury better than adults, and males better than females. Patients suffering from granular kidney, scrofula, scurvy and malarial cachexia are peculiarly susceptible to this drug. Some are so peculiarly susceptible to this drug, that very small doses may cause salivation. The writer treated a patient, in whom 3 grs. of calomel with compound colocynth extract, produced severe mercurialism although he was purged by the pill. Pregnancy is no bar to the administration of mercury.

Acute toxic action.—Acute poisoning is not common. Mercurials, especially the mercuric salts, produce severe **gastro-enteritis**, with vomiting, pain, purging, and bloody stools, collapse, and even death.

Antidotes.—Emetics, stomach pump cautiously, and then only at the very commencement. Demulcent drinks, milk, albumen, oil, gluten freely. The best plan is to first give demulcent drinks and then wash out the stomach. Morphine and alcohol subcutaneously.

Chronic toxic action, Hydrargyriism or Mercurialism.—This is now rare, but occurs occasionally either as the result of accident or malpraxis. The first indications of mercurial poisoning are fetor of the breath and soreness of the gums (the medicinal administrations of mercury should not go further), soon followed by a disagreeable metallic taste; swollen, red, spongy gums bleeding on the least touch; and increased salivary discharge. These symptoms increase, the tongue becomes furred and swells, the tonsils and pharyngeal glands enlarge, there is swelling and tenderness of the parotids and submaxillary glands, the teeth get loosened, the gums recede and become ulcerated, the saliva gets thick and viscid, and pours out of the mouth, fever and depression set in, &c. If the dose is large and long continued these symptoms are aggravated, and end in the falling out of the teeth, ulceration and abscess of the mouth, necrosis of the jaw-bones, great prostration, anæmia, emaciation, repeated hæmorrhages, and death.

Protracted exposure to a moderate degree of mercurial vapour produces a different train of symptoms, generally known as **mercurial tremor**. Besides the cachectic symptoms there are muscular tremors, first beginning at the face, then invading the arms and the legs, extreme weakness of the affected muscles (mercurial palsy); mental weakness, and functional disturbance of special senses. These tremors differ from those of paralysis agitans in that they are increased by attempts at voluntary movement, i.e. they are "intention tremors."

Metallic mercury vaporizes even at the ordinary temperature and may produce poisonous effects even though the evaporating surface be small if the emanations from it continue for any length of time.

Several cases are on record in which mercurial cachexia has resulted from vaporization of the mercury with which the backs of mirrors are coated. The student should bear this fact in mind for future guidance.

THERAPEUTICS OF MERCURY AND ITS SALTS

Externally.—As an **antiseptic**, cyanide and perchloride of mercury are used, but the solution of the latter is largely employed for **disinfecting** purposes, as well as in **surgical** and **obstetric** practice. A lotion (1 in 1000) is strong enough for washing infected rooms, furniture, articles, linen, the surgeons' and gynæcologists' hands, the parts to be operated upon, and for moistening dressings, towels, wool, &c. A lotion (1 in 10,000) may be ordinarily used for washing wounds and ulcers, but the former strength can be advantageously employed if they are foul or of syphilitic origin. In obstetric practice, a solution of 1 in 5000 is the strength ordinarily used for irrigation of the vagina and uterus, but its strength requires to be diminished to 1 in 10,000, if used continuously for any length of time.

Professor Lockwood prefers the lotion of the soluble iodide as this salt does not combine with albumen and there is therefore less risk of absorption. Moreover it does not give the wound that "pickled" appearance which results from the use of the perchloride.

As a parasiticide.—Citric and white precipitate ointments and perchloride lotion (1 to 2 grs. in 1 oz. of water) are employed to destroy

the fungus of **tinea**, such as of ringworm, **mentagra**, and **favus**; and **animal parasites**, such as the various kinds of lice and their nits and the *Acarus scabiei*. The red oxide or citrine ointment is very effective in **tinea ciliaris**. The eyelashes should be cut short and the scabs removed before the application of the ointment, which may be diluted if necessary. The oleate is a useful application in **pityriasis versicolor**.

As a remedy for Pruritus.—Blue ointment, calomel ointment (1 dr. to 1 oz.) black wash and yellow wash relieve the distressing itching of many **skin diseases**, such as urticaria, prurigo, pruritus ani, pruritus pudendi, psoriasis, lichen, pityriasis of the scalp and eczema. If applied with care and not to a large area, there is very little danger of salivation.

As a stimulant and promoter of absorption.—The plaster, the liniment and the various ointments, such as oleate, red precipitate, Scott's and red iodide are used for dispersing **glandular enlargements**, as buboes; and for promoting the absorption of inflammatory products, as in **chronic joint disease**, **chronic peritonitis** and **periostitis**. Ung. Hyd. Iod. Rubri is a capital application for **goitre** especially if the patient be made to sit in the sun or before a fire immediately after the application has been made. It is also said to absorb **bony tumours** and outgrowths of horses and cattle. Calomel dusted into the eye is a valuable remedy for phlyctenular ophthalmia.

As an antiphlogistic.—Diluted citrine ointment if applied over **whitlows** and **boils** and then covered with plaster rapidly causes them to abort. Marshall strongly recommends oleatum hydrargyri (liquid) 5 p.c. with morphine (1 in 60) in **synovitis**, **articular inflammation**, **mammary** and other glandular inflammations, **tonsillitis**, **epididymitis**, **threatened suppuration** or abscess, &c. Mercurial ointment is useful in **onychia** and **paronychia**. A ten minutes' application followed by a poultice every hour cuts short the inflammation. Scott's dressing applied to **indurated** and **inflamed carbuncles** softens and subdues inflammation.

As an irritant and caustic.—Mercuric nitrate lotion is employed to destroy **warts**, **condylomata**, **lupus** and other small excrescences, but much of this caustic action is no doubt due to the free nitric acid it contains.

As a specific.—Mercurial ointments, black wash and yellow wash are always prescribed for dressings over chancres and other syphilitic sores. Blackwash is an unirritating application, when the sores are kept wet with a bit of lint soaked in it. Nothing is so good as to wash all suspicious sores with a perchloride lotion (1 in 500). According to Ringer a cyanide of mercury lotion (5 to 15 grs. in water 1 oz.) is a good local application to syphilitic sores, such as those of the penis, throat, tongue, anus, &c. Besides their use in syphilitic sores, they are of great service in all varieties of skin diseases, originat-

ing from syphilis. Local use must be combined with internal administration.

Finely powdered calomel is also applied locally in syphilitic and other affections of the eye (phlyctenular ophthalmia). When applied in this way it is important to bear in mind that potassium iodide must not be simultaneously administered internally, otherwise it will appear in the lachrymal secretion and then, mixing with the calomel, will produce an iodide of mercury, and violent inflammation of the eye will be the result.

Internally. **Gastro-intestinal tract.**—Local syphilitic sores in the mouth soon heal under the use of the perchloride mouth-wash (Perchloride 4 grs., Acid. Hydroch. Dil. 10 ms. in water 10 ozs.). **Vomiting** in infants whether occurring immediately after feeding or at other times is stopped by grey powder in $\frac{1}{2}$ gr. or $\frac{1}{3}$ gr. given every two or three hours (Ringer). **Infantile diarrhoea** whether acute, subacute or chronic, with clay-coloured, offensive, or dark green, or slimy, or curdy stools, soon yields to small doses of calomel or grey powder. In **infantile cholera**, the vomiting and purging are soon arrested by an hourly dose of grey powder ($\frac{1}{3}$ gr.). **Cholera** too in adults has been checked by calomel given in 2 to 3 gr. doses alone, or in combination with bismuth and camphor. Large doses (20 to 30 grs.) of calomel are utterly useless in this disease. In that form of **quinsy** or **scarlatina**, in which the difficulty in breathing is insuperable, Ringer recommends $\frac{1}{3}$ gr. of grey powder every hour. Cases of obstinate **hiccough** have been checked by small doses of calomel. Blue pill or calomel is given as a **purgative** but it should never be prescribed to habitual opium-eaters, or to a patient under opium treatment, for fear of absorption and constitutional symptoms. In every case, it is a good plan to follow the mercurial by a saline aperient. A mercurial preparation should not be given nightly as a purgative, for it not only loses its effect, but there is a chance of accumulation. Sometimes, it produces severe gastro-enteritis. Perchloride of mercury $\frac{1}{100}$ gr. given hourly or every two hours, has been recommended by Ringer in **chronic diarrhoea** of adults marked by pale watery stools, and in acute and chronic **dysentery**. A full dose as large as can be borne has sometimes produced wonderful results in **ulcerative enteritis**. Calomel or grey powder in small doses or as a purgative clears the thickly coated creamy tongue of many acute diseases.

In **biliousness** or **hepatic derangement** due perhaps to free living, a dose of blue pill or calomel at night, followed by a dose of compound senna mixture, or Seidlitz powder or compound liquorice powder next morning, produces excellent results.

Inflammatory diseases.—Few now prescribe mercury in **acute inflammatory diseases**, except in **iritis**, but there are many who yet use it in **meningitis** and inflammation of other serous membranes, whilst American writers are now recommending its use in **endocarditis**.

Dropsy and ascites.—Calomel given several times a day acts as a diuretic in **cardiac dropsy**. Its efficacy is greatly increased if combined with digitalis and squill, as in Guy's pill (see page 386). It is said also to benefit, though temporarily, **ascites** due to **cirrhosis** of the liver. It should never be given in renal dropsy.

Syphilis.—Mercury is an antidote for the syphilitic virus. Its efficacy is most marked in **primary** and **secondary syphilis**, but opinions differ as to its efficacy in tertiary syphilis. In true **hard** or **indurated chancre**, mercurials should not only be employed locally, but given internally until the thickening and induration pass away. Mercurialism should never be induced. Any non-irritant preparation, such as calomel, Plummer's pill, blue pill or grey powder should be steadily continued till the gums are affected, or symptoms of salivation threaten, when its use should be suspended for a while. Calomel 1 gr. with opium $\frac{1}{2}$ gr., Plummer's pill 5 grs., or grey powder 2 grs., are generally used for this purpose. Besides giving it by the mouth, the constitution can be soon brought under the influence of mercury by other methods which are detailed below. Though mercury is not recommended in **tertiary syphilis**, the writer often uses it with potassium iodide with decidedly good results. According to Keyes an unremitting use of mercurials in small doses for two years can eradicate the poison from the constitution. Green iodide is still prescribed, but its instability is a serious drawback. Grey powder is an excellent remedy for **congenital syphilis**. The routine treatment for a child six months old is half a grain three times a day for 3 days, then once at night, so long as the child thrives. Mercury acts in syphilis by destroying the specific spirochæta of Schaudinn. Metchnikoff has shown that if the syphilitic virus be injected into men or monkeys the development of the disease is completely prevented if a mercurial ointment is rubbed into the seat of inoculation an hour or two afterwards. The formula for this "Unguentum Prophylaxis" Metchnikoff is:—

℞ Hydrargyri ammoniat.	.	.	gr. XXV
Hydrargyri subchlor.	.	.	gr. XXV
Hydrargyri salicyl-arsenatis	.	.	gr. XXV
Lanoline	.	.	ad gr. c

To be used by inunction for 4 to 5 minutes after coitus. Medical men, nurses and students are advised to have the ointment handy to apply to any suspicious crack about the fingers, &c.

Modes of administration.—Mercury can be introduced into the system by the following methods:

1. **By the mouth.**—By this route we administer blue pill, calomel, grey powder, corrosive sublimate, &c., for absorption by the mucous membranes of the stomach and intestines.

2. **By the rectum.**—Mercurial suppository is used for local action.

3. **Inhalation.**—This method is rarely resorted to.

4. **Fumigation.**—Volatilized calomel is administered by this method (*see* p. 70). Simultaneous diaphoresis induced either by steam or jaborandi given internally, helps its action. Fumigation sometimes causes great weakness and prostration, but, on the whole, it is considered to be the best, for it does not disorder the functions of the stomach and bowels. Many rebellious cases of syphilis, where the administration by the mouth has failed, yield to fumigation or inunction. Fumigation can be used for either local or general action.

5. **Inunction.**—By rubbing blue ointment, liniment, or oleate of mercury into the skin, mercury can be rapidly introduced into the blood. The inner surface of the thigh or the axilla is a suitable spot for inunction. This method is specially useful for the treatment of young children; 20 to 60 grs. of blue ointment may be rubbed in nightly or every other night. The site of rubbing should be varied for fear of local irritation. The German ointment (1 of Hg. in 3) is no doubt superior to the B.P. preparation, but much of the success of the treatment of syphilitic cases at Aix is due probably to the superior climate of the place and the regulated life of the patient.

6. **Endermically.**—Calomel is dusted over raw blistered surfaces or ulcers or mercurial lotion applied. Mercury may thus be absorbed.

7. **Hypodermically.**—The hypodermic or intramuscular method is much used in the British Army and abroad. The salts thus used may be soluble, in which case the injections must be made daily or mercury and its insoluble salts may be used when weekly injections are made. Amongst the soluble salts thus injected are the perchloride $\frac{1}{4}$ gr. dissolved in 17 ms. of distilled water to which a little sodii chloride $\frac{1}{4}$ gr. is added; or the mercury biniodide in a strength of $\frac{1}{4}$ gr. The most powerful, and undoubtedly the most effective of the insoluble salts is calomel, suspended in sterilized olive oil or vasoline, the dose being $\frac{1}{4}$ gr. of calomel to 17 ms. of olive oil injected once a week. It occasionally gives rise to very severe pain. Another favourite insoluble preparation is "Grey oil" consisting of:—

R	Hydrargyrum	.	.	.	.	$\frac{3i}{iv}$
	Adeps lanæ anhyd.	.	.	.	.	$\frac{3iv}{x}$
	Paraffin liquid	.	.	.	.	ad $\frac{5x}{x}$
	(Carbolized 2 p.c.)					

The customary dose of this preparation is 10 ms. weekly. Strongly recommended by many authorities, this intramuscular injection is condemned by Sir J. Hutchinson. The absorption of the insoluble salts is uncertain, accumulation followed by sudden absorption has occurred with resulting death from mercurial poisoning.

8. **Intravenous injection.**—Lane injected successfully 20 ms. of a 1 p.c. solution of cyanide of mercury into the most prominent vein below the elbow.

9. **Baths.**—Mercuric chloride is used for a bath (*see* p. 70).

Caution.—Unless appetite and digestion are good, mercury should not be given by the mouth. Weak, anæmic, and scrofulous subjects

and those suffering from kidney disease cannot bear mercurials. For fear of absorption it should not be employed over a large area. Concentrated solutions should not be used as injections into the vagina and uterus.

The following instructions should be given to a patient when he is to be placed upon a prolonged course of mercury:—

- (1) Avoid fruits, green vegetables, coffee and aperients.
- (2) Lessen your stimulants.
- (3) Stop smoking altogether.
- (4) Dress warmly and beware of chills.

HYDRASTIS RHIZOMA

Hydrastis. N.O. *Ranunculaceæ*

Syn.—Golden Seal.

Habitat.—United States and Canada.

Source.—The dried rhizome and roots of *Hydrastis canadensis*.

Characters.—Rhizome $\frac{1}{2}$ to $1\frac{1}{2}$ in. long, $\frac{1}{4}$ to $\frac{1}{2}$ in. thick, tortuous, simple or branched, yellowish-brown becoming darker by age. Cup-shaped scars of decayed branches on the upper surface. Rootlets from the lower surface and sides. Fracture resinous, brownish-yellow. Odour characteristic. Taste bitter.

Incompatibles.—Tannic acid, hydrochloric acid, alkalis.

Composition.—It contains alkaloids, (1) *Berberine*, (2) *Hydrastine*, (3) *Canadine*.

Action.—Stomachic, tonic, and hæmostatic.

OFFICIAL PREPARATIONS

1. **Extractum Hydrastis Liquidum.**—1 in 1. **B.P. Dose.**—5 to 15 ms.
2. **Tinctura Hydrastis.**—1 in 10. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.

NON-OFFICIAL PREPARATIONS

1. **Extractum Hydrastis.**—The liquid extract evaporated. **Dose.**—2 to 5 grs.

2. **Hydrastinum.** **Syn.**—*Ext. Hydrastis*, *B.P.C.*—By extracting with 90 p.c. alcohol; contains 20 p.c. of total alkaloids. **Dose.**— $\frac{1}{2}$ to 2 grs. in pill.

3. **Hydrastina.**—A white crystalline alkaloid resembling strychnine in appearance. Acts like quinine, though milder. **Dose.**— $\frac{1}{4}$ to $\frac{1}{2}$ gr. in pill or hypodermically.

4. **Hydrastinæ Hydrochloridum.**—A faintly yellow crystalline salt, soluble in water. **Dose.**— $\frac{1}{4}$ to 1 gr.

5. **Hydrastinæ Hydrochloridum.**—A pale yellow crystalline powder, soluble in water. Strengthens weak labour pains and checks uterine hæmorrhage. **Dose.**— $\frac{1}{2}$ to $1\frac{1}{2}$ grs.; hypodermically in 10 p.c. solution.

6. **Hydrastinæ Tartaras Acidus.**—Fine white needles, specially soluble in water. **Dose.**— $\frac{1}{2}$ to 1 gr.

7. **Glycerinum Hydrastis**, *B.P.C.*—Is resin-free, hence miscible with water. **Dose.**—15 to 60 ms.

PHARMACOLOGY

Externally.—Hydrastis acts as a **stimulant** and **antiseptic** to ulcerated surfaces.

Internally.—Hydrastis being bitter, promotes appetite and digestion, and stimulates gastric and intestinal secretion and peristalsis. It is therefore a **stomachic**, **tonic** and **laxative**. It is said to possess an alterative or tonic action on the mucous surface. It slightly increases the secretion of bile and urine. It contracts the unstripped muscular fibres of the arteries and those of the uterus, hence it is **hæmostatic** and **ecbolic** though the contractions are not so strong as those produced by ergot. In large doses it is a **cardiac depressant**, and causes fall of blood-pressure. Hydrastine produces nervous symptoms similar to those of quinine, and is a mild **febrifuge**. It contracts the tissues of the engorged spleen, and thereby reduces its size. It is said to produce abortion but this is doubtful.

THERAPEUTICS

Externally.—Hydrastis has been employed as a dressing to chronic unhealthy ulcers, and as an application to eczema (5 to 20 grs. in lard 1 oz.). Hydrastin (1 dr. in mucilage acacia 4 grs.) or the tincture or liquid extract (2 or 4 drs. to 1 pint) makes an efficient lotion for injection in **gonorrhœa** after the acute stage, **gleet**, **leucorrhœa**, **cystitis**, **otorrhœa**, &c. Whitla thinks that a weak infusion of hydrastis is more potent in these cases. Locally it has also been used to arrest **hæmorrhage** from the nares, rectum and uterus, and in **hyperidrosis**, **acne**, &c. Better results are always obtained by combining external treatment with internal use.

Internally.—Either the liquid extract or the tincture (diluted with an equal part of water) can be used as a gargle in **aphthous stomatitis** and **chronic pharyngitis**, or as an injection for **chronic nasal catarrh**, **otorrhœa**, **leucorrhœa**, or **gonorrhœa**. Hydrastine insufflation is a good local application for the latter disease, and an ointment of the strength of 5 to 20 grs. in 1 oz. has proved useful in **eczema**. Hydrastis is one of the most useful remedies we have for chronic **gastric** and **intestinal catarrh**, especially if it be the result of chronic alcoholism. On account of its contractile action on the unstripped muscular fibres of all the arteries and those of the uterus, it has been largely employed in arresting **hæmorrhages**, especially the **uterine**. In short, it may be used in all cases where ergot is indicated. One of the notable effects of hydrastis is, that it not only checks uterine hæmorrhage but soothes uterine and ovarian pain, and it has therefore been employed in **menorrhagia**, **dysmenorrhœa**, **metrorrhagia**, **endometritis**, and in the reduction of **uterine tumours**. It does not cause painful contractions like ergot and is therefore sometimes used to strengthen weak labour pains. Some authors claim that it is useful for the same **diseases of the heart** as are benefited by

digitalis. As an **antiperiodic** it is far inferior to quinine. It has been found very useful, on several occasions, for checking the night-sweats of phthisis.

HYDROGENII PEROXIDI LIQUOR

Solution of Hydrogen Peroxide. H_2O_2

Source.—Prepared by the interaction of water, barium peroxide, and a dilute mineral acid, at a temperature below 50° F. Should yield ten times its volume of oxygen.

Characters.—A colourless, odourless liquid with a slightly acid taste. Renders saliva frothy. It readily decomposes on coming in contact with metallic oxide or heat. **Impurities.**—Barium, mineral matter, and less oxygen.

Action.—Powerfully antiseptic, alterative.

B.P. Dose.— $\frac{1}{2}$ to 2 drs. in solution.

NON-OFFICIAL PREPARATIONS

1. **Oxygen water.**—Is drunk as an exhilarating beverage. Used in *diabetes*, *dyspepsia*, *tetanus*, *hydrophobia*, *eclampsia*, *exophthalmic goitre* and *pneumonia*.

2. **Oxygen gas.**—Compressed oxygen gas is obtainable in cylinders containing 12 to 20 cubic feet. Before inhalation, a rubber tube with an inhaler may be attached, the gas coming out in a gentle stream. Dr. G. Stoker has recently been very successful in the treatment of *indolent ulcers* by exposing them to the vapour of oxygen gas, which has the power of killing off putrefactive bacilli and stimulating the growth of benign microbes. **Oxygen inhalation** is of great use in *pneumonia*, relieving *dyspnoea* and reducing *pyrexia*. It is successfully employed in *cardiac and respiratory failure*, *Bright's disease*, *angina*, *asthma*, *phthisis*, &c.

3. **Oxydol.**—Formerly known as "*Eau Maiche*" contains three times its volume of available oxygen. Recommended as a *wound dressing*.

4. **Ozonic Ether.** A more stable preparation miscible with water. In conjunction with Tr. guaiacum it acts as a test for blood, the colour of which it changes to blue.—Recommended in *diabetes* and *whooping-cough*. **Dose.**— $\frac{1}{2}$ to 1 dr.

5. **Pyrozone.**—Is an American speciality containing hydrogen peroxide of several strengths. A 3 p.c. solution is used internally as an antiseptic, and a 25 p.c. solution in ether as a caustic.

6. "**Sanitas**" Fluid.—Contains, as active principles, hydrogen peroxide, thymol, soluble camphor, and camphoric acid. It is a non-poisonous antiseptic.

7. **Magnesi Peroxidum.** *Syn.*—*Hopogan*.—A white tasteless powder. Used in *anæmia*, *anorexia*, *flatulence*, *phthisis*, and *pyrosis*. **Dose.**— $\frac{1}{2}$ to 1 teaspoonful.

8. **Zinci Peroxidum.** *Syn.*—*Ektogan*.—A white insoluble powder. Promotes healing of *chronic ulcers*.

9. **Sodii Peroxidum.** *Syn.*—*Sodium Dioxide*.—A white deliquescent powder, dissolved in water with production of heat and evolution of oxygen. Used as a means of producing oxygen in a patented "*oxygenator*." Also in dentistry. An anhydrous soap, containing 10 to 20 p.c. of the salt, useful in *acne*.

10. **Alphozone** $(\text{COOH} \cdot \text{CH}_2\text{CH}_2\text{CO})_2\text{O}_2$.—A finely crystalline white powder, produced by the synthesis of Succinic Acid and Hydrogen Peroxide. Reaction acid. Taste slightly acid and bitter, leaving a metallic after-taste. Solubility 1 in 60 of water, solution being accompanied by hydrolysis and the production of nascent hydrogen peroxide. A 1 p.c. solution is easily tolerated in the mouth. Useful as a non-toxic germicide. *Dose*.—2 grs. in solution.

PHARMACOLOGY

Externally.—Hydrogen peroxide is a recent introduction into the B.P. Being a powerful oxidizing agent, it destroys organized ferments, but has no effect on enzymes. A few drops of a 1½ p.c. solution destroy hydrophobic virus. It causes effervescence when in contact with pus, thus killing bacteria. Hence it is a powerful **antiseptic** and **disinfectant**. It bleaches hair and cleanses the skin.

Internally.—The action is antiseptic and alterative like that of iodine.

THERAPEUTICS

Externally.—Hydrogen peroxide is largely used in dental surgery, and many cosmetics owe their efficacy to its presence. A solution (1 in 8) may be used with benefit in **sores, foul suppurating wounds, chancres** and **fœtid discharges from the ear**.

Internally.—As a spray and pigment it has been used in diphtheria and scarlatinal sore throat. It has been recommended on theoretical grounds in many infective diseases and metabolic disturbances, such as **scarlatina, fever, diabetes, pertussis** and **uræmia**, but with poor results, and it has been used in the form of vapour to prevent cyanide poisoning in gold mines.

Caution.—Its hypodermic use is dangerous on account of the possibility of "gas-embolism."

HYGROPHILA. *Hygrophila*

N.O. *Acanthaceæ*. (*Ind. and Col. Addendum*)

Syn. B.P.—*Asteracantha*. **Syn. I. V.**—*Kule-khârâ*, Beng. *Talma-khana*, Hind.

Habitat.—India and Eastern Colonies.

Source.—The dried herb including the root of *Hygrophila spinosa*.

Characters.—Roots with numerous rootlets, tapering; stem 2 to 4 ft. high, quadrangular, branches and leaves opposite. Leaves entire, 6 at each node; outer two about 4 to 5 in. long and ½ in. broad; 4 inner about 1½ in. long. In the axil of each leaf is a yellowish spine about 1 in. long. Leaves and stems are furnished with hispid, spreading, scattered white hairs. Flowers bright purplish-blue, four pairs at each node. Calyx four sepals, one broader than the others. Corolla glabrous, two lipped with didynamous stamens. Ripened ovary with 4 to 8 seeds.

Composition.—*Cholesterol*, an alkaloid. *Inorganic salts, fixed oil and mucilage*.

Action.—Demulcent and diuretic.

OFFICIAL PREPARATION

1. **Decoctum Hygrophilæ.**—1 in 10. **B.P. Dose.**— $\frac{1}{2}$ to 2 ozs.

NON-OFFICIAL PREPARATION

1. **Acetum Hygrophilæ.**—Dried leaves 2 ozs., Distilled Vinegar 16 ozs. Macerate 3 days, then press and strain. **Dose.**— $\frac{1}{2}$ to 1 $\frac{1}{2}$ ozs.

PHARMACOLOGY AND THERAPEUTICS

The entire plant is considered by Indians to possess diuretic and demulcent properties. It is therefore used as a diuretic in cases of **dropsy** and **hepatic obstruction**, and as a diuretic and demulcent in urinary affections such as **cystitis** and **gonorrhœa**.

HYOSCYAMI FOLIA

Hyoscyamus Leaves. N.O. *Solanaceæ*

Syn. B.P.—Henbane leaves.

Habitat.—Britain.

Source.—The fresh leaves and flowers, with the branches to which they are attached, of *Hyoscyamus niger*, also the leaves and the flowering tops separated from the branches and carefully dried, collected from the flowering biennial plants.

Characters.—Leaves vary in length up to 10 in., mostly sessile, alternate, exstipulate, triangular-ovate or ovate-oblong, acute, sinuate, pale green, furnished with glandular hairs particularly underneath. Branches cylindrical and glandular-hairy, corolla yellow, odour strong, taste bitter and slightly acrid when fresh.

Resembles.—Belladonna and Stramonium leaves, neither of which is hairy.

Composition.—Two crystallizable alkaloids (1) *Hyoscyamine* and (2) *Hyoscyne* (Scopolamine), and a poisonous oil.

Incompatibles.—Liquor potassæ, lead acetate, silver nitrate, and vegetable acids.

Action.—Anodyne, sodative, narcotic.

OFFICIAL PREPARATIONS

1. **Extractum Hyoscyami Viride.** **B.P. Dose.**—2 to 8 grs.
2. **Pil. Colocynthis et Hyoscyami.**—See Colocynth, p. 363.
3. **Succus Hyoscyami.** **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.
4. **Tinctura Hyoscyami.**—1 in 10. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.

NON-OFFICIAL PREPARATIONS

1. **Chloroformum Hyoscyami.**—Hyoscyamus Root in powder 30, Chloroform 20.
2. **Tinctura Hyoscyami Radicis.**—Hyoscyamus Root in powder 5, Alcohol (60 p.c.) 40, digest for 7 days. **Dose.**—20 to 60 ms.

PHARMACOLOGY

Hyoscyamine, the principal alkaloid in hyoscyamus, is isomeric with atropine and is easily converted into the latter in the presence

of a fixed alkali at the ordinary temperature. Most of the properties of hyoscyamus must therefore be naturally identical with those of belladonna and stramonium (*see* Belladonna, page 265). The following are however the chief points of difference: (1) Hyoscyamus is less deliriant and has a marked and rapid **sedative and soporific effect on the cerebrum**. (2) It has also more pronounced **sedative action on the spinal cord**. (3) It *increases* the **peristaltic contraction of the intestines** and is at the same time more **efficacious in relieving griping and irregular contraction**, thereby acting as a carminative. (4) It is **not** a powerful *stimulator* of the **heart**. (5) It relieves **irritation of the urinary passages, especially that of the bladder**. This it does by depressing the terminal ends of the nerves of the mucous membrane, and controlling the spasms of the muscular fibres. (6) Hyoscyne *diminishes intra-ocular tension*, and therefore hyoscyamus does not affect this so much as belladonna. Some authorities say that it acts as a laxative, but the writer has not observed this effect in medicinal doses.

THERAPEUTICS

Besides its use in those cases where belladonna is indicated, it is employed (1) to soothe cerebral excitement and produce sleep, as in **mania and insomnia**; (2) to lessen **cardiac asthma**; (3) to correct the painful griping of purgatives; (4) to relieve **vesical spasm** in cystitis, prostatitis, calculus, &c., often in combination with other urinary sedatives as buchu, pareira, &c., and the alkalis; and (5) to relieve cough, as in bronchitis.

Children can bear very large doses, while the old and weak cannot.

HYOSCINÆ HYDROBROMIDUM

Hyoscyne Hydrobromide

Syn. B.P.—Hydrobromate of Hyoscyne, Scopolamine, Hydrobromide.

Source.—The hydrobromide of an alkaloid contained in hyoscyamus leaves, different species of Scopolia, and other solanaceous plants.

Characters.—In colourless, transparent crystals, permanent in the air and soluble 1 in 4 of water, not 1 in 1 as in the B.P.

Action.—Hypnotic.

B.P. Dose.— $\frac{1}{200}$ to $\frac{1}{100}$ gr. either by the mouth or hypodermically. May be increased to $\frac{1}{50}$ gr.

NON-OFFICIAL PREPARATIONS

1. **Injectio Hyoscinæ Hypodermica.**—1 gr. in 1000 ms. of distilled water. *Dose.*—5 to 10 ms.
2. **Hypodermic Lamels** contain $\frac{1}{200}$ gr. each with gelatin.
3. **Guttæ Hyoscinæ.**—2 grs. in water 1 oz.
4. **Ophthalmic Discs** contain $\frac{1}{200}$ and $\frac{1}{100}$ gr.

PHARMACOLOGY AND THERAPEUTICS

Hyoscyne has a powerful sedative action on the convolutions of the brain and produces sleep, and is largely employed in **mania**,

insomnia, insanity, delirium tremens, and puerperal mania. It is not a depressant to the heart, though it slows the pulse, but till more is known of its action it is not safe to use it in valvular diseases, with a failing compensation. It has a prolonged mydriatic action. It acts wonderfully in calming maniacal excitement. Merck's preparation should alone be prescribed, as the commercial specimens vary much in purity. It is safer to use at first a lower dose $\frac{1}{800}$ to $\frac{1}{100}$ gr. hypodermically.

Schneiderlein recommends a combination of Scopolamine and morphia for the production of general anæsthesia. He injects $\frac{1}{800}$ gr. of Scopolamine Hydrobromide and $\frac{1}{4}$ grain of a Morphia salt on the night previous to the operation, and a similar or larger dose in the morning before the operation. This usually produces deep sleep and the patients do not wake till some hours after the operation, thus escaping the most painful period.

HYOSCYAMINÆ SULPHAS

Hyoscyamine Sulphate

Source.—The sulphate of an alkaloid contained in hyoscyamus leaves and possibly other solanaceous plants.

Characters.—A crystalline, deliquescent, odourless powder, having a bitter, acrid taste.

Tests.—It is distinguished from atropine by its brilliant **golden-yellow scales**, when its acidulated solution is acted upon by the solution of auric chloride; whilst with atropine, the precipitate has a **dull pulverulent appearance**.

Action.—Sedative and hypnotic.

B.P. Dose.— $\frac{1}{80}$ to $\frac{1}{16}$ gr. by the mouth or hypodermically.

NON-OFFICIAL PREPARATIONS OF HYOSCYAMINE

1. **Hyoscyaminæ Hydrobromidum.**—In small white granular crystals soluble 3 in 1 of water. *Dose.*— $\frac{1}{80}$ to $\frac{1}{16}$ gr.
2. **Injectio Hyoscyaminæ Hypodermica.**—Sulphate 1 gr., Distilled Water 2 drs. *Dose.*—1 to 2 ms.
3. **Hypodermic Lamels.**— $\frac{1}{80}$ and $\frac{1}{16}$ gr. in each.
4. **Ophthalmic Discs.**— $\frac{1}{800}$ gr. each.
5. **Hyoscyamine granules.**— $\frac{1}{80}$ gr. each. Useful in *sea-sickness*.

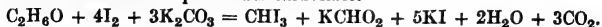
PHARMACOLOGY AND THERAPEUTICS

Hyoscyamine resembles in action atropine more than hyoscine, but its mydriatic effect is more intensified. It has been used in **mania, insomnia, delirium tremens, chorea, neuralgia, asthma and paralysis agitans**, with less benefit than hyoscine. Ringer says that he tried it in delirium tremens without any success, and found identical results in acute mania with atropine. Sometimes it produces sleep where opium has failed. Only Merck's preparation is reliable. It should be used with caution.

IODOFORMUM

Iodoform. Tri-iodomethane. CHI_3

Source.—Prepared by the action of iodine on ethylic alcohol in the presence of solution of potassium carbonate.



Characters.—Shining, lemon-yellow, small, hexagonal crystals, unctuous to the touch, with a persistent and disagreeable odour and taste. Volatilizes slowly and contains iodine 96.7 p.c. **Solubility.**—Slightly in cold water, 1 in 7 of ether, 1 in 12 of chloroform, 1 in 120 of alcohol (90 p.c.), 1 in 100 of glycerin, 1 in 10 of collodion, 1 in 14 of oil of eucalyptus, 1 in 30 of olive oil, and also in fixed and volatile oils. Sparingly in Benzol. **Impurities.**—Soluble yellow colouring matters, iodides, picric acid.

Incompatibles.—Calomel, silver and other nitrates, pot. chlorate, and nitrites.

Action.—Antiseptic, deodorant, and alterative.

B.P. Dose.— $\frac{1}{2}$ to 3 grs. in pill or emulsion.

OFFICIAL PREPARATIONS

1. **Suppositoria Iodoformi.**—3 grs. in each. A local antiseptic and anæsthetic.

2. **Unguentum Iodoformi.**—1 in 10. Antiseptic, disinfectant, and antisymphilitic.

NON-OFFICIAL PREPARATIONS

1. **Iodoformum Præcipitatum.**—A primrose-yellow, impalpable powder.

2. **Buginarium Iodoformi et Eucalypti** (Cheyne).—Iodoform 5 grs., Eucalyptus Oil 10 ms., Cacao Butter 35 grs. in each. In *gonorrhœa*.

3. **Collodium c. Iodoformo.**—Iodoform 1, Collodion Flexile 12. As a pigment in *venereal sores* and *glandular swellings*.

4. **Emulsio Iodoformi, U.C.H.**—Iodoform 10, Glycerin 70, Water 20. For injection into *sinuses*, and *abscess cavities*.

5. **Insufflatio Iodoformi, B.P.C.**—Iodoform 1, Bismuth Subnitrates 1. Mix. In affections of the ear, nose and throat.

6. **Nebula Iodoformi (T.H.)**—Iodoform 40 grs. in ether 1 oz. Strong antiseptic and detergent.

7. **Iodoform Dressings.**—Gauze 5, 10, 20 p.c.; Wool and Lint 3, 5 and 10 p.c.; Plaster Mulls, 10 p.c.

8. **Iodoform Varnish.** *Syn.*—*Whitehead's Paint.*—Contains Iodoform 10 p.c. in Tr. Benz. Co., of which ether is substituted for alcohol.

9. **Pastillus Iodoformi (T.H.)**—1 gr. with glyco-gelatin 18 grs. in each. In *syphilitic eruptions* of the tongue, mouth, throat, &c.

10. **Ung. Iodoformi c. Atropina.**—Iodoform precipitated 60 grs., Atropine 2 grs., Soft Paraffin 1 oz. Dissolve atropine by heat, and mix Iodoform when cold.

11. **Unguentum Iodo-Paraffini.**—Iodoform 1, Oil of Eucalyptus 8, dissolve by gentle heat, and add to melted Paraffin 27 and soft Paraffin 6, stir until cold.

SUBSTITUTES FOR IODOFORM

1. **Airol.**—See Bismuth p. 279.
2. **Antiseptol.** *Syn.*—*Cinchonine Iodo-sulphate.*—Iodine 50 p.c. Cheap and free from odour. Ointment 1 dr. in 1 oz. zinc ointment for *lupus*, &c. (Shoemaker).
3. **Aristol.** *Syn.*—*Di-Thymol-Iodide.*—Prepared by mixing solution of iodine in potassium iodide with thymol solution. A reddish-brown powder insoluble in water and glycerin, but soluble in collodion, ether, and oils. Useful in *ulcerative lupus*, *tinea*, *eczema*, *psoriasis*, when applied as an ointment 10 p.c. or dusted, or in collodion.
4. **Bismuth Resorcinate, Sodium-phospho-salicylate, and Subgallate** (see Bismuth, p. 282).
5. **Cresol** and **Cresalol** or **Salicylate of cresol** are powerful antiseptics superior to iodoform, since they are harmless and less disagreeable in their odour, besides have astringent action. The former is given in 15 grs. in *intestinal phthisis*, and the latter in 3 to 8 grs. in *diarrhæa* and *typhoid fever*.
6. **Di-iodoform.** *Syn.*—*Ethylene Periodide.*—Prismatic, yellow inodorous needles, insoluble in water, soluble in chloroform and ether.
7. **Eka-Iodoform.**—A compound of iodoform and paraform having strong antiseptic action.
8. **Eudoxin.**—See Bismuth, p. 282.
9. **Europhen.** *Syn.*—*Isobutyl-ortho-cresyl-iodide.*—Yellow amorphous powder with saffron odour, containing 28 p.c. iodine. Insoluble in water and glycerin, but soluble in chloroform, ether. Used as a dusting powder and ointment 10 p.c. It is bland, unirritating and harmless and is considered to be the best substitute for iodoform. Flick rubs $\frac{1}{2}$ oz. solution (1 in 20) of olive oil in *early phthisis* into the groins and armpits with good effect. Used also hypodermically 15 ms. of a 1 p.c. solution in olive oil in *secondary syphilis*.
10. **Iodoformin.**—A compound of iodoform and hexamethylenetetramine. A white powder turning yellow by exposure.
11. **Iodoformal.**—A compound of iodoform and ethyl-hexamethylene-hydriodide possessing higher antiseptic properties than either iodoform or iodoformin.
12. **Iodoformogen.**—A compound of Iodoform with 90 p.c. of albumen. A wound dressing.
13. **Iodoformum Bitaminatum.**—A compound of tar and iodoform, having an agreeable odour. Employed like iodoform in the powdered form.
14. **Iodol.** *Syn.*—*Tetra-Iodo-Pyrrol.*—A brownish-white powder without disagreeable smell and toxic action, insoluble in water, but soluble in 1 in 145 of glycerin, alcohol, chloroform, and ether. Externally it acts like iodoform, and internally like potassium iodide in 1 to 3 grs. in pill or capsule.
15. **Iodo-Salicylic Acid** and **Di-Iodo-Salicylic Acid.**—Are compounds of iodine and salicylic acid and having the combined action of both. *Antipyretic, analgesic, and antirheumatic.* Succeeded where salicylates failed. The dose of the latter 20 grs. and upwards.
16. **Loretine.**—A yellowish odourless crystalline powder, being a non-irritating and non-poisonous substitute.

17. **Losophan.** *Syn.*—*Meta-Tri-Iodo-Cresol*.—A greyish crystalline odourless powder containing iodine 80 p.c. Recommended as an anti-parasitic.

18. **Nosophen.** *Syn.*—*Tetra-iodophenolphthalein*.—A cream-coloured almost odourless powder containing 60 p.c. of iodine. Combines with bases (see Bismuth, p. 282). A good intestinal antiseptic. *Dose*.—3 to 8 grs. The sodium salt of Nosophen is a blue powder known as **Antinodin**; and the bismuth salt is a reddish-brown powder known as **Eudoxin**.

19. **Naphthol-Aristol.** *Syn.*—*Di-Iodide of β -naphthol*.—A greenish-yellow, odourless, tasteless powder, employed in *skin diseases*.

20. **Sanoform.** *Syn.*—*Methyl-Di-Iodo-Salicylate*.—Light-white, odourless, non-poisonous, unirritating crystals, containing iodine 60 p.c. Said to possess wonderful desiccating properties, useful in *ophthalmic practice* and *ulcers*.

21. **Sozoiolol Salts.**—Sozoiolol is Di-Iodo-Para-Phenolsulphonic Acid, containing Iodine 54 p.c., Sulphur 7 p.c., and Phenol 20 p.c. It combines with **Sodium**, **Potassium**, **Ammonium**, **Lead**, **Mercury**, and **Zinc**, which form odourless substitutes.

22. **Sulphaminol.** *Syn.*—*Thio-oxo-diphenylamine*.—A yellow, tasteless, odourless, harmless powder, which splits up into sulphur and phenic acid when in contact with the fluids of the body. Useful in *laryngeal phthisis* and nasal discharges as insufflation. *Dose*—4 grs. in cystitis.

23. **Thio-Resorcin, Di-iodo-thio-Resorcin.**—They are compounds of sulphur and resorcin, and are odourless, non-poisonous, amorphous powders. The former is yellowish-white and the latter brown.

24. **Thiuret.**—Is a crystalline derivative of sulphaminol and phenol sulphinate. Nascent sulphur is given off when in contact with moist surfaces.

25. **Traumatol.** *Syn.*—*Iodocresol*.—An insoluble odourless substitute containing Iodine 54 p.c.

Besides the above, there are many more which are not important.

PHARMACOLOGY

Externally.—Iodoform when locally applied is a **deodorant, antiseptic** and **disinfectant**. This action is due to the decomposition of the iodoform and the liberation of nascent iodine by many agents, such as living cells, ptomaines, light, air, &c.; but before this decomposition can take place the iodoform must first be dissolved in the fats of the tissues. None of the agents above mentioned have any effect upon undissolved iodoform. This decomposition, as one would expect, does not take place very rapidly. It must not therefore be supposed that when iodoform is applied to a wound iodine is set free so abundantly as to cause local irritation; on the contrary iodoform is a **local anæsthetic**.

Internally.—The precise action of iodoform within the body is not well understood. To a certain extent it acts like an iodide. In the stomach it acts as a **sedative** and **depresses the heart**. In large doses it produces toxic symptoms. It is eliminated by the **breath** as iodine, and by the **urine** as iodides and iodates.

Toxic action.—Acute poisoning is rare now. Chronic poisoning may take place either from repeated doses, or from absorption from a raw

surface. The symptoms are malaise, vertigo, dilatation of the pupil, loss of appetite, gastro-intestinal disturbance, quick, feeble pulse, fever (temperature sometimes rising to 104° F.), delirium, mania, or melancholia, erythema and perhaps eczema, convulsions, collapse and at times death. Fatty degeneration of the liver and muscles, hæmaturia, and albuminuria sometimes occur. These symptoms may come on suddenly, or may develop gradually, lasting for weeks. Moorhof says that poisoning never occurs if iodoform is used alone, and without other antiseptics. The statement is however incorrect. Some persons are peculiarly susceptible to iodoform, and toxic symptoms have occurred after the slightest dusting of the powder upon a small wound.

Treatment of Iodoform poisoning.—If iodoform is dissolved in the fats and ptomaines present in a wound, iodine is set free. Its vapour then passes into the body-fluids and is resolved by the *alkaline* serum into five molecules of iodates and one of iodide. In those tissues having an acid reaction iodine is again set free and *acts on the tissue on which it is liberated*. The **cerebral cortex**, the **mucous membrane of the stomach**, and the **sweat glands**, all have an acid reaction. Hence the cerebral, gastric, and cutaneous symptoms in iodoform poisoning, and it now appears to be established that by giving 15 grs. of sodium bicarbonate every hour, we can alleviate the symptoms and lessen the ill-effects of the drug. Stimulants, diaphoretics, and sponging the skin with warm water are also recommended.

THERAPEUTICS

Externally.—Iodoform is employed as a local antiseptic, but the strong characteristic smell is the chief drawback to its use. However, it can be disguised by coumarin (50 p.c.) or oil of geranium (1 in 25). Any of the numerous substitutes can be used instead. It is extensively employed in surgery in various forms such as dusting, collodion, ointment, emulsion, bougie, gauze, wool, &c., in **wounds, sloughing sores, lupus, rodent, syphilitic and scrofulous ulcers, chancres, bed-sores, cancers, ozæna, abscess cavities, sinuses, fistulæ, gonorrhœa, granular lids, &c.** Iodoform soaked in glycerin and water and covered over by cotton-wool may be usefully employed in **burns**. The ointment removes **itch**. Collodion iodoform subdues **mumps, buboes and chronic glandular enlargements**. The writer uses saturated collodion with great success in these diseases, and also applies it over **neuralgic spots** and **gouty and rheumatic joint inflammations**. Iodoform inunction and inhalation have been largely employed in **phthisis**. The suppository is used to relieve painful conditions of the bladder and rectum and the ointment gives great relief in **pruritus ani**. Iodoform (1 to 2 grs. in ether) has been injected into the lungs in **phthisis**, and around tubercular joints (about $\frac{1}{2}$ oz. of a 10 p.c. glycerin emulsion). It may be insufflated for **otorrhœa** and frequently proves extremely beneficial.

Internally.—It is rarely used internally. As a spray, pastil, or insufflation, it is used in syphilitic sores of the mouth, tubercular pharyngitis, and laryngitis. It has been unsuccessfully used in **gastric ulcers** and **phthisis**.

Caution.—The weak and the aged are liable to poisoning. Children bear it well.

Prescribing hints.—Iodoform is rarely used for internal administration. In a mixture or lotion, suspend it with mucilage of acacia. When in pill it is massed with glucose, or $\frac{1}{4}$ its weight of pulv. tragacanth co. Its disagreeable odour is covered by eucalyptus and geranium (5 ms. to 2 dr.), oils, balsam of Peru, musk, and coumarin prepared from Tonka beans.

IODUM. Iodine. I

Source.—A solid non-metallic element obtained from the ashes of seaweeds and sponges and from native iodides and iodates. Hence its old name of "spongia usta." Formerly burnt sponges were largely used in the treatment of tumours without their active principle being understood.

Characters.—Rhombic prisms or octahedrons of a peculiar odour, dark colour, metallic lustre, yielding violet vapour on heating. *Solubility.*—1 in 5000 of water, and freely in alcohol (90 p.c.), ether, or solution of potassium iodide or sodium chloride. *Impurities.*—Water, iron, iodine cyanide.

Identification.—Easy, its peculiar metallic lustre and suffocating odour at once identify it.

Incompatibles.—Mineral acids, metallic salts, vegetable alkaloids, oil of turpentine, and ammonia.

Action.—Antiseptic, rubefacient, lymphatic stimulant, absorbent, and alterative.

Enters into.—The preparation of Arsenic, Iron, Lead, Mercury, Potassium, Sulphur, and Sodium Iodides. Of these, Potassium and Sodium Iodides only will be described here.

OFFICIAL PREPARATIONS

1. **Liquor Iodi Fortis.** *Syn.*—*Linimentum Iodi* '85 (altered).—1 in 8 $\frac{1}{2}$. About four times the strength of Tr. Iodine.
2. **Tinctura Iodi.**—1 in 40. **B.P. Dose,** 2 to 5 ms. diluted.
3. **Unguentum Iodide.**—1 in 25. Resolvent, irritant, alterative.

NON-OFFICIAL PREPARATIONS

1. **Iodo-Glycerin Solution.** *Syn.*—*Morton's Fluid.*—Iodine 10 grs. Pot. Iodide 30 grs., Water 25 ms., Glycerin to 1 oz. Injected into the sac of a *spina bifida*.
2. **Iodized Phenol.**—Acid, Carbolic, and Iodine, equal parts.
3. **Pigmentum Mandl, T.H.**—Iodine 6 grs., Pot. Iodide 20 grs., Ol. Menth. Pip. 5 ms., Glycerin to 1 oz. In *granular pharyngitis*.
4. **Pigm. Iodi et Olei Picis.** *Syn.*—*Coster's Paste.*—Iodine 1, Oil of Tar 4. Dissolve cautiously by the aid of gentle heat. Useful in *ringworm*.
5. **Liqr. Iodi, B.P. 1885.** *Syn.*—*Lugol's Solution.*—Iodine 2, Pot. Iodide 3, Water 40.
6. **Tr. Iodi Decolorata, B.P.C.**—Iodine 2·5, Rectified Spirit 27·5; dissolve with a gentle heat, and when cold, add strong solution of Ammonia, 6·25; keep the mixture in a warm place until decolorized, after which dilute it with Rectified Spirit to 100. Undiluted it may be used as *Tr. Iodi Decolorata Fortior*.

7. **Pasta Iodi et Amyli.**—Starch 1, Glycerin 2, Water 6. Boil together, and add Liq. Iodi B.P. '85, when nearly cold. A good cleanser and *healer of sores*, especially if syphilitic.

8. **Syrupus Acidi Hydriodici. B.P.C.** Dose.—20 to 60 ms. well diluted.

9. **Vapor Iodi.**—Tr. Iodi 1 dr., Water 1 oz. Apply gentle heat and inhale.

10. **Amylum Iodatum.** Syn.—*Iodized Starch.*—Iodine 1, Water *q.s.* to moisten, powdered Starch 20. Triturate. Dose.— $\frac{1}{2}$ to 4 drs., rubbed up in milk and water. In *syphilis* and as an **antidote** to unknown poisons. Externally as a substitute for iodoform.

11. **Iodopyrin** or **Iodantipyrine.**—Colourless, inodorous, tasteless antiseptic powder prepared by mixing iodine and antipyrine. Used in *asthma* and *rheumatism* with good results. Dose.—5 to 10 grs.

12. **Iodine Trichloride.**—Iodine 50 p.c. A yellow powder prepared by interaction of iodine and chlorine gas. A solution (1 dr. to water 1 gallon) is a powerful antiseptic. In *fermentative dyspepsia* in $\frac{1}{2}$ oz. doses of the solution.

13. **Iodinol** or **Iodipin.**—A yellow, oily liquid compound of iodine and *sesame* or *teel oil*. Winterniaz considers it more easily assimilable and efficacious than Pot. Iodide. Dose.—1 to 4 drs. daily, subcutaneously or by inunction.

14. **Iodo-Caffeine.** See p. 293.

15. **Iodothyrim.** Syn.—*Thyronodin.*—An active principle containing iodine extracted from the thyroid gland. A powerful alterative.

16. **Iodalbacid.**—A compound of Iodine and albumen, containing 10 p.c. Iodine. A brown powder, tasteless and odourless. Given in *epilepsy* and *syphilis*, may be continued indefinitely. Dose.—15 grs.

PHARMACOLOGY

Externally.—The action of iodine is identical with that of chlorine, but not so energetic. It is a powerful **antiseptic, disinfectant, deodorant** and **antiparasitic**, decomposing organic compounds and killing germs and parasites. Locally, its action is **irritant, rubefacient** and **vesicant**, according to the strength and length of the application. It stains the skin yellowish-brown and deadens the cuticle, which peels off. Iodine dilates local blood-vessels and causes exudation of leucocytes, and thus stimulates absorbent vessels. It is a point of practical importance that widespread inflammation of an erysipelatous character may be set up by painting the skin with iodine, especially in children and rheumatic subjects. It may also be absorbed into the circulation when it undergoes the change already described under the head of iodoform, and may in a similar manner lead to irritation of any internal organ which has an acid reaction.

Internally. **Gastro-intestinal and respiratory tracts.**—It irritates both. In the stomach and intestines it is slowly converted into iodide or iodate of sodium, but much may be left free to cause vomiting, purging and colic. In minute doses it occasionally stops vomiting. Inhalation of iodine produces **irritation** of the respiratory passages, cough, sneezing, frontal and thoracic pain and dyspnoea.

Remote effects.—For a description of these the student is referred to the pharmacological action of iodoform and the iodides. Nothing further need be said here on these points.

THERAPEUTICS

Externally.—The chief application of iodine is a local one. The tincture, ointment or liquor is often used to stimulate **foul, indolent or lupoid ulcers**, and as a counter-irritant in **subacute and chronic inflammations** of joints, synovial membranes, lymphatic glands, pleura, pericardium, lungs, liver, spleen, uterus, ovary, periosteum, peritoneum, &c. Tr. iodi has been successfully injected into **abscesses, sinuses, cysts, hydroceles, bronchoceles, joint-cavities, empyema and spina bifida**. Liquor iodi or linimentum iodi being very strong cannot be painted more than twice, or at the utmost thrice over the same spot. If the application causes much pain and irritation, the iodine can be washed off with alcohol, brandy, whisky or eau-de-cologne, or better still with a solution of potassium iodide or liqr. potassæ. The liquor or tincture may be painted over the chest to help the absorption of **pleuritic fluid**, and to control the harassing cough and the secretion of chronic **bronchitis** and **phthisis**. Blistering with the strong liquor around or near a threatening **abscess, bubo or carbuncle**, lessens the inflammation. Iodine may also be painted over and around the circumjacent skin, to prevent the spread of **erysipelas** and **carbuncle**. Coster's paste is an effective application in **parasitic skin diseases**, such as ringworm, favus and scabies. Iodized phenol is a valuable local application in **endometritis**. To prevent discoloration of the skin Tr. Iodi Decolorata may be employed, but it is not so efficient as the B.P. tincture or ointment. Vapor iodi is an efficacious inhalation in **hoarseness, diphtheria** and **phthisis**. To prevent bronchial irritation it is inhaled with chloroform and steam. Iodine lotion (Iodine 2 to 4 grs., Pot. Iodide 2 grs., water 1 oz.) removes **opacity of the cornea** when it is of recent origin and does not involve the cornea to any depth.

Internally.—Free iodine is rarely used. Tr. iodine painted over the gums and teeth **dissolves tartar**, heals ulcers and stimulates the **growth of gums**, when they have ulcerated and receded. Iodine gargle (2 to 4 drs. in water 8 ozs.) checks **mercurial salivation**, and heals **syphilitic and non-syphilitic sores** of the mouth and throat. Pigmentum Mandl is a capital application for **chronic granular pharyngitis**. Tr. iodi 1 or 2 drops in 1 oz. of water at times checks vomiting, when given every $\frac{1}{2}$ hour. Iodine is recommended in **scrofula, malarial fever** and **gout**, but the writer has used tincture of iodine in chronic malarial fevers without appreciable benefit. Sometimes iodine does good in **syphilis** and **scrofula**, where its salts fail.

Caution.—As iodine is a gastro-intestinal irritant, it should be freely diluted and administered after food. In the stomach it is

converted into iodide of starch, which is less irritant. Trousseau gives the tincture in sugared water or in sherry.

POTASSII IODIDUM

Potassium Iodide. KI

Source.—(1) Dissolve iodine in a solution of potassium hydroxide and evaporate to dryness; $6\text{KHO} + 3\text{I}_2 = 5\text{KI} + \text{KIO}_3 + 3\text{H}_2\text{O}$. (2) Mix the residue with charcoal and heat, thereby to remove the oxygen of iodate as carbonic oxide; $2\text{KIO}_3 + 6\text{C} = 2\text{KI} + 6\text{CO}$. (3) Dissolve and purify.

Characters.—Colourless, opaque, cubic crystals with a feebly alkaline reaction. **Solubility.**—4 in 3 of water, 1 in 12 of alcohol (90 p.c.), and 1 in 3 of glycerin. **Impurities.**—Iodates, nitrates, bromides, cyanides, &c.

Incompatibles.—Bismuth subnitrate, sp. ætheris nitrosi, liquorice, liq. strychnine, alkaloidal salts, and substances containing starch.

Action.—Alterative, resolvent, expectorant, diuretic.

B.P. Dose.—5 to 20 grs. in solution or pill.

Enters into.—Liqr. Iodi Fort. (26½ grs. nearly), Tr. Iodi (10 grs. nearly), Ung. Iodi (17½ grs.), and the

OFFICIAL PREPARATIONS

1. **Linimentum Potassii Iodidi cum Sapone.**—1 in 10 by wt. A creamy unirritating alterative and resolvent substance, not staining the skin.

2. **Unguentum Potassii Iodidi.**—1 in 10. White; acting in the same way as the above.

NON-OFFICIAL PREPARATION

1. **Lint. Potassii Iodidi, B.P.C.**—Soft Soap 13½, Pot. Iodide 10, Glycerin 7, Lemon Oil 1, Alcohol (60 p.c.) *q.s.* to 100.

SODII IODIDUM

Sodium Iodide. NaI

Source.—Prepared from iodine and sodium hydroxide by a process similar to that adopted in making potassium iodide; the salt being crystallized at a temperature of not less than 68° F.

Characters.—A dry white crystalline deliquescent powder having a saline and somewhat bitter taste. **Solubility.**—11 in 6 of water, 1 in 3 of alcohol (90 p.c.). **Impurities.**—The same as of potassium iodide.

Action.—The same as of potassium iodide, but more assimilable and less depressing.

B.P. Dose.—5 to 20 grs.

NON-OFFICIAL IODINE SALTS

1. **Ammonii Iodidum.**—A whitish deliquescent salt, becoming yellow from exposure to air (shaking the mixture with a piece of ammon. carb. removes the colour). Freely soluble in water. **Dose.**—3 to 20 grs.

2. **Rubidii Iodidum.**—In colourless cubic crystals soluble in water. Less depressant and better tolerated by the stomach. **Dose.**—5 to 20 grs.

3. **Strontii Iodidum.**—White crystalline mass. **Dose and action** as of Rubidii Iodidum.

PHARMACOLOGY OF IODIDES

Externally.—Potassium and sodium iodides are freely absorbed, being decomposed by the sweat.

Internally.—The action of the salts of iodine is identical with that of iodine, except that they are less irritant to the gastro-intestinal canal, and are therefore used in preference to iodine. Of these, potassium iodide is the most largely employed. In minute doses it improves appetite and body weight of healthy individuals. It is quickly absorbed and is converted into sodium iodide: this again is slowly decomposed by small quantities of nascent oxygen (set free by living protoplasm) acting upon the iodide in an acidulated solution, the acid being provided either by carbonic acid in the blood, or the acid secretions of different organs. In large doses it produces a group of symptoms known as "**iodism**." Besides the characteristic action of iodine, it has a certain definite action of its own. It increases the secretion of bronchial glands during its elimination through the respiratory mucous membrane, producing a flow of thin mucus, and liquefying tenacious secretions; hence it is an **expectorant**. It is also an indirect **antispasmodic**. In large doses it causes **diuresis**, but how far this diuretic action is due to the large doses of alkali, or to the iodine, is not known. Large doses of the salt (10 grs.) **lessen** the secretion of **milk**, produce **atrophy** of **mammæ** and **testicles**, and destroy **sexual power**. Potassium iodide, or at least the iodine, disengages certain metallic poisons, such as mercury and lead, from their albuminous compounds, forms soluble salts, and removes them from the tissues. It has a specific effect on the **syphilitic virus**, but how this is effected is not known.

Elimination.—Iodides are rapidly eliminated by the mucous membranes, especially those of the air-passages, also by the urine, saliva, mammæ and sweat glands. In escaping through the skin it produces **cutaneous eruptions** starting from the orifices of the sweat glands. This is due to the liberation of nascent iodine as already described.

Iodism.—Some individuals are very susceptible to its influence, even $\frac{1}{2}$ to 1 gr. producing symptoms of iodism; while others can bear much larger quantities (1 to 4 drs. daily). The characteristic symptoms of iodism are running of the eyes and nose, sneezing, oedema around the eyes, frontal headache, brassy taste in the mouth, loss of appetite, with irritation of the fauces and trachea. These grow intense if the iodides are pushed, leading to swollen gums, furred tongue, salivation, and in some cases vomiting, diarrhoea, bronchitis, and cutaneous eruptions.

Antidotes.—Carbonate of ammonia, sp. ammon. aromat., or bicarbonate of potassium controls iodism. Fowler's solution prevents skin eruptions.

THERAPEUTICS OF IODIDES

Externally.—The liniment and ointment of Pot. iodide are used for the same purposes as the preparations of iodine, with this advantage,

that they neither stain nor irritate the skin, but they are decidedly weaker.

Internally.—Iodides are employed in the same class of diseases, where iodine is indicated either internally or externally; but the following deserve a special notice:—

1. **Stomach and liver.**—Potassium iodide given after food, in minute doses say $\frac{1}{2}$ gr. with aromatic spirit of ammonia or ipecacuanha wine is of great service in **atonic dyspepsia**. It is said to do good to **cirrhosis of the liver** in its early stage.

2. **Respiratory passages.**—Pot. iodide 10 grs. given at bedtime cuts short an attack of acute **coryza** at the outset, whilst chronic colds are relieved by small doses. In acute **febrile catarrh**, it is serviceable when given with antimonial wine. It relieves **asthma** (15 to 20 grs.) whether dependent on cold or not. In **bronchitis**, it liquefies the phlegm and helps expectoration; and in **pneumonia** and **pleurisy**, helps the absorption of effused products.

3. **Heart and blood-vessels.**—It is useful for absorbing the effusion in **pericarditis**, and the deposits over the **cardiac valves**. In **mitral regurgitation** and **aortic obstruction**, the writer obtained excellent results from protracted use. **Internal aneurysms**, with varying pains, are materially benefited by large doses (20 grs. and upwards) of potassium iodide. Here, it acts by reducing the blood-pressure, increasing the coagulability of the blood and influencing the arterial coats. Beneficial effects have been obtained in **angina**, by giving it in the interval between the attacks. Potassium iodide is also a very valuable remedy in **arterio-sclerosis**. Stockman has recently suggested that possibly the value of this drug is due to its acting upon the thyroid gland and stimulating it to produce a larger amount of Thyroidin.

4. **Lymphatic glands.**—Iodides together with the local application of iodine, reduce the size of chronic enlargements of lymphatic glands, scrofulous or otherwise.

5. **Kidneys.**—Occasionally potassium iodide acts as a powerful diuretic in **Bright's disease** and removes the anasarca wonderfully, but it has little influence on the total amount of albumen.

6. **Brain.**—Many authorities recommend the use of potassium iodide in **hydrocephalus**, but it only acts as a palliative. In **meningitis** with exudations, and other cerebral lesions of syphilis, a combination of iodide with bromide is more efficient than any other remedy known, but in order to have the full benefit the iodide must be used in large doses, say 1 or $\frac{1}{2}$ dr.

7. **Skin.**—Many syphilitic cutaneous diseases, such as **psoriasis** and **erythema**, are sometimes cured by full doses of iodides.

8. **Scrofula.**—The iodides, especially Syrupus Ferri Iodidi either alone or with cod-liver oil, have a remarkable effect in **tuberculosis** when the glands are affected; but they have little effect on the tubercles of the lungs.

9. Syphilis.—What mercury is in the primary and secondary stage, iodides are in the tertiary. Under its use **periostitis, nodes, gummata, syphilitic deposits** in the brain and other organs disappear with remarkable rapidity. Success depends upon boldly pushing the drug in doses of 20 to 40 grs. 3 or 4 times a day. In secondary syphilis even, it sometimes does great good when combined with corrosive sublimate. It cures barrenness of women due to syphilis. In congenital syphilis, the iodides are also efficacious, but the system becomes less tolerant after the poison is destroyed. In primary syphilis they have no effect.

10. Metallic poisons.—Potassium Iodide eliminates lead and mercury from the system, magnesii sulphas should always be given in these cases in combination with the iodide, otherwise the metallic salt may be reabsorbed from the bowels. During elimination, mercury may cause salivation. Argyria is also treated successfully with iodides. Some authorities recommend this salt in mercurial salivation, but there is a chance of salivation being increased by it as it is a sialagogue itself.

11. Rheumatism.—Chronic rheumatism, gonorrhœal rheumatism, rheumatic arthritis and chronic gout always yield to iodides, especially the two former. Pains resembling rheumatism and increasing at night, whether due to syphilis or not are removed very quickly by them.

The action of sodium iodide is similar to that of potassium iodide but it is not much used. Ammonium and rubidium iodides are less depressant.

Prescribing hints.—Remember that small doses of iodide will often cause iodism whereas large ones will not. By administering the drug in milk large doses can be given with impunity. Ammonium carbonate or potassium bicarbonate also checks the symptoms of iodism. Iodides are incompatible with alkaloidal salts, and should not be prescribed with Liquor Strychnine which will throw down alkaloidal precipitates.

IPECACUANHÆ RADIX

Ipecacuanha Root. N.O. *Rubiaceæ*

Syn.—Hippo.

Habitat.—Brazil.

Source.—The dried root of *Psychotria ipecacuanha*.

Characters.—Tortuous pieces, up to 6 in. long, and $\frac{1}{4}$ in. thick, colour dark, brick-red or brown, closely annulated. Fractured surface exhibits a greyish, resinous, or starchy cortex, and a dense central portion. Odour slight. Taste bitter. The Carthagenæ variety (*non-official*) is thicker, with annulations less marked. **Impurities.**—Hemidesmus root, cracks, no annulated; almond powder with Pulv. Ipecac. known by its prussic acid odour when moistened.

Identifications.—The beadlike and ringed appearance is peculiar and characteristic of ipecacuanha. Note its colour and section.

Composition.—(1) *Emetine*, 1.45 p.c. (2) *Cephaeline* 0.52 p.c. (3) A third alkaloid *psychotrine*. (4) Ipecacuanhic or cephaelic acid. (5) A glucoside. (6) Starch, volatile oil, gum, &c.

Action.—Expectorant, emetic.

B.P. Dose.— $\frac{1}{2}$ to 2 grs. as an expectorant; 15 to 30 grs. as an emetic. For a child 1 year old, $\frac{1}{2}$ to $\frac{1}{4}$ gr. as an expectorant, and 2 to 4 grs. as an emetic.

OFFICIAL PREPARATIONS

1. *Acetum Ipecacuanhæ* (altered).—1 in 20. **B.P. Dose.**—10 to 30 ms.
2. *Extractum Ipecacuanhæ Liquidum* (new).—2 to 2½ grs. alkaloids in 110 ms. Standardized. **B.P. Dose.**— $\frac{1}{2}$ to 2 ms. as an expectorant, 15 to 20 ms. as an emetic.
3. *Pilula Ipecacuanhæ cum Scilla*.—1 in 20. Opium 5 p.c. **B.P. Dose.**—4 to 8 grs.
4. *Pilula Ipecacuanhæ cum Uriginea* (*Ind. and Col. Addendum*).—Compound Ipecac. Powder 3, Uriginea 1, Ammoniacum 1, Syr. Glucose q.s. Opium 1 in 20. **B.P. Dose.**—4 to 8 grs.
5. *Pulvis Ipecacuanhæ Compositus*. *Syn.*—*Dover's Powder*.—Ipecac. 1, Opium 1 in 10. Fawn-coloured. Diaphoretic, anodyne. **B.P. Dose.**—5 to 15 grs.
6. *Trochiscus Ipecacuanhæ*.— $\frac{1}{2}$ gr. in each.
7. *Trochiscus Morphine et Ipecacuanhæ*.— $\frac{1}{8}$ gr. Morph. and $\frac{1}{2}$ gr. Ipecac. Acts like Dover's powder.
8. *Vinum Ipecacuanhæ* (altered). **B.P. Dose.**—10 to 30 ms. as an expectorant; 4 to 6 drs. as an emetic; 1 dr. as an emetic for a child 1 year old.

NON-OFFICIAL PREPARATIONS

1. *Pulvis Ipecac. sine Emetina*. *De-emetized Ipecacuanha*.—Said to be equally efficacious in *dysentery* without causing vomiting. *Dose.*—10 to 30 grs.
2. *Linctus Ipecacuanhæ*, B.P.C.—Acet. Ipecac., Syr. Tolu, Glycerin, and Mucilage Tragacanth equal parts. *Dose.*—1 dr.
3. *Syr. Ipecacuanhæ (Aceticus)* B.P.C.—Acetum Ipecac. 1 pint, Sugar 36 ozs., dissolve by gentle heat. *Dose.*— $\frac{1}{4}$ to 2 drs.
4. *Glyc. Ipecacuanhæ*, B.P.C.—Acet. Ipecac. 1, Glycerin 1. In *whooping-cough*. *Dose.*— $\frac{1}{2}$ to 1 dr.
5. *Emetine Hydrochloride* and *Emetine Hydrobromide*.—In silky filaments. *Dose.*— $\frac{1}{6}$ to $\frac{1}{2}$ gr. (expectorant); $\frac{1}{2}$ to 1 gr. (emetic). Emet. Hydrochlor. 1 gr. in sherry 8 ozs. makes *Vinum Emetinæ* of the same strength as Vin. Ipecac. Powerful expectorant and emetic.
6. *Cephaeline Hydrochloride*.—In colourless crystals. More powerful emetic than emetine. *Dose.*— $\frac{1}{2}$ to $\frac{1}{4}$ gr.

PHARMACOLOGY

Externally.—Powdered ipecacuanha acts as an irritant, rubefacient and pustulant on the unbroken skin. Inhaled it produces irritation of the eyes and nose, sneezing, bronchial secretion, leading sometimes to asthma. It kills anthrax bacilli.

Internally. **Alimentary canal and liver.**—It has an unpleasant bitter taste and excites flow of saliva. In small doses ($\frac{1}{2}$ to $\frac{1}{4}$ gr.) it

increases the secretion of the gastric juice by stimulating the local circulation, and is therefore **stomachic** and **tonic**. In large doses it creates nausea with secretion of mucus. In larger doses, 15 to 30 grs., it produces vomiting, partly by its direct influence on the peripheral ends of the pneumogastric, and partly by stimulating the vomiting centre; hence it is a **direct** and **indirect emetic** (see page 125). This indirect emesis can be produced by injecting emetine or cephaeline after cutting the pneumogastric. The vomiting is slow but certain and is unaccompanied by much nausea or prostration. In drop doses ipecacuanha wine acts as an **antiemetic** in certain conditions.

Large doses no doubt **irritate** the **intestines**, causing hyperæmia, stimulation of the glands and peristalsis, hence there is a considerable amount of secretion, leading to purging.

The **liver** is **directly stimulated** by the alkaloids of ipecacuanha and there is a plentiful secretion of bile, therefore ipecacuanha is a **direct cholagogue** (see page 131).

Heart and blood.—Emetine and cephaeline are absorbed into the blood from the mucous membranes and excreted by them; especially those of the respiratory tract, stomach, and intestines. They have no definite action on the blood. They depress the heart in larger doses.

Respiratory tract.—During elimination, ipecacuanha powerfully stimulates the bronchial mucous membrane, causing hyperæmia, and **increases its secretion**; consequently it is an **expectorant**. Rossbach has demonstrated that emetine increases the tracheal secretion like apomorphine.

Skin.—Moderate doses ($\frac{1}{2}$ to 1 gr.) stimulate the skin and produce **diaphoresis**, which action is increased by the combination with opium (Dover's powder).

Uterus.—Ipecac. directly increases the uterine contractions and is sometimes used in early stage of labour. The student should keep this fact in mind when treating pregnant women with large doses of the drug.

THERAPEUTICS

Externally.—Ipecacuanha is rarely used, though recommended in anthrax. Applied as a paste it allays the pain of wasp and hornet stings.

Internally. Alimentary canal.—As a stomachic tonic, powdered ipecacuanha ($\frac{1}{2}$ to $\frac{1}{2}$ gr.) is used with other stomachics and bitters in **atonic dyspepsia**. Ipecacuanha wine in 1 m. doses every $\frac{1}{4}$ or $\frac{1}{2}$ hour remarkably checks the **vomiting of pregnancy**, **alcoholism**, **migraine** and **gastric irritability** during febrile attacks and other diseases. In cases where it fails, the writer combines it with $\frac{1}{4}$ m. of dilute hydrocyanic acid with good results; ipecacuanha is not a suitable emetic in **poisoning** as its action is tardy, but it is exceedingly efficacious in **croup** and **bronchitis** of children, not only by mechanically expelling the mucus, but by its influence on the respiratory mucous membrane. The subsequent depression is highly beneficial.

1 to 2 drs. of the wine must be given every 1 or 2 hours until the child vomits. With some it merely acts as a purgative. It makes an excellent emetic in bilious attacks and in the early stage of fevers. The compound powder sometimes gives good results in **gastric ulcers**.

Powdered ipecacuanha in 20, 30 or even 60 or 90 grs. cures **acute dysentery**, but how it does this is not known. Some patients can retain such large doses, while others cannot. To prevent its being rejected, it is better to give an opium draught, or a hypodermic injection of morphine an hour before the administration of the drug. Keep the patient in a recumbent position, and allow no water or food for at least four hours afterwards. If it is brought up even then, it can be injected per rectum, suspended in mucilage, with 15 to 20 *ms.* of liquid extract of opium. In subacute and chronic cases and **diarrhoea** Dover's powder acts well. The **dysenteric diarrhoea** of children, acute or chronic, generally yields to drop doses of ipecacuanha wine (Ringer). Rogers has shown that hypodermic use of soluble salts of emetine in $\frac{1}{4}$ to $\frac{1}{2}$ gr. daily acts as a specific in **amoebic dysentery**. $\frac{1}{4}$ gr. may be given to children daily. $\frac{1}{2}$ gr. is equivalent to 45 grs. of powdered ipecacuanha. Emetine given thus is of value in differentiating the types, as amoebic dysentery will always react to emetine.

It is a most effective remedy for **catarrhal jaundice and torpidity of the liver**, when given alone or combined with other cholagogues. The writer cured a few cases of such jaundice with ipecacuanha and gentian pills. It is a favourite constituent of aperient and cathartic pills.

Respiratory passages.—As an expectorant, ipecacuanha in the form of wine, acetum, liquid extract, lozenge or syrup, is being daily used in colds, catarrhs, acute and chronic bronchitis and broncho-pneumonia. The inhalation of ipecacuanha spray benefits **winter cough, bronchial asthma, bronchitis accompanied by dyspnoea** and bronchitis of old emphysematous persons. It is worth trying in suitable cases. Ipecacuanha is also recommended in **hay asthma** and **whooping-cough**. In **acute pneumonia**, large doses have been given with success.

In nauseating doses it is recommended in **hæmoptysis** and hæmorrhages from other organs, but it has no specific influence over them, beyond depressing the circulation.

IRIDIN. (*Non-official*)

Syn.—Extractum Iridis, B.P.C.

Source.—An extract obtained from the root of *Iris versicolor*, the Blue Flag.

Characters.—A dark brown powder, having a bitter acid taste.

Action.—Cathartic, alterative, diuretic. *Dose*,—1 to 3 grs.

PHARMACOLOGY AND THERAPEUTICS

Iridin is used in **biliousness** and all sluggish conditions of the liver. It should be administered in the form of a pill made up with glycerin of tragacanth or extract of hyoscyamus. It may be usefully combined with euonymin and podophyllin.

ISPAGHULA. Spogel SeedsN.O. *Plantagineæ*

(Ind. and Col. Addendum)

Syn. I. V.—*Isupgul*, Beng., Hind.**Habitat.**—India and Eastern Colonies.**Source.**—The dried seeds of *Plantago ovata*.**Characters.**—About $\frac{1}{10}$ in. long and $\frac{1}{10}$ in. wide. Ovate elliptical, boat-shaped, pinkish; the convex side bearing a dark spot.**Composition.**—(1) *Mucilage*, 1 in 20 of water forms a thick tasteless jelly.
(2) *Fatty oil* and albuminous matter.**Action.**—Demulcent, mild astringent.**B.P. Dose.**—50 to 150 grs.

OFFICIAL PREPARATION

1. **Decoctum Ispaghulæ.**—13·7 of seeds to 1000 of water. **B.P. Dose.**— $\frac{1}{2}$ to 2 ozs.

PHARMACOLOGY AND THERAPEUTICS

Externally.—The bruised seeds, moistened with water, form an excellent emollient poultice, and can be used for the same purposes as linseed. When made with vinegar and oil they are applied over rheumatic and gouty swellings.

Internally.—Ispaghul has long been known and used by the people of India as a remedy for **diarrhoea** and **dysentery**. Its beneficial effects are more marked in the chronic stages. Many cases of inflammatory diarrhoea and dysentery yield to its use when other remedies fail. It is supposed to form a protective layer of mucilage over the inflamed parts of the intestinal mucous membrane. It is generally taken, in these cases, alone with water (1 in 40) when it forms a mucilaginous mass. Many of the swollen seeds pass out with the motions, and their action is supposed to be mechanical as well as astringent over the intestinal ulcers. The writer often combines it with bruised *kurchee seeds* (*Wrightia antidysenterica*), commonly known as "*Indrajat*," the dose is 5 grs. every two or three hours, and this combination will be found to yield most encouraging results. The decoction is also used as a demulcent in **cough** and **sore throat**, and formed into a *sherbet* (seeds, sugar and water) it is largely used as a cooling beverage in **gonorrhoea** when it acts as a mild diuretic and soothes the irritation of the urethra during micturition.

The mucilage exists in the covering of the seeds only and a decorticated preparation, known as "*Isupghul ka chilka*" can be obtained

from any *pausari's* shop. This preparation should be used if there is any fear of irritation of intestinal ulcers from the seeds.

The remedy is tasteless and is well suited both to adults and children.

JABORANDI FOLIA

Jaborandi Leaves. N.O. *Rutaceæ*

Syn.—*Pilocarpi Foliola*.

Habitat.—Brazil (Pernambuco).

Source.—The dried leaflets of *Pilocarpus jaborandi*.

Characters.—Dull green, oval-oblong or oblong-lanceolate, $2\frac{1}{2}$ to 4 in. long, shortly petiolate, obtuse, and emarginate apex, unequal base, entire, revolute margin, coriaceous texture. Mature leaflets glabrous with prominent veinlets on the upper and scattered hairs on the under surface. Odour aromatic when bruised. Taste at first bitter aromatic, afterwards pungent, increasing flow of saliva. *Impurities.*—Leaves of several species of *piper*. In Brazil these are all known as jaborandi.

Identification.—The prominent midrib and translucent dots with the emarginate apex at once distinguish it. Mark its shape and colour.

Composition.—(1) *Pilocarpine*, the chief alkaloid, is a colourless liquid. (2) *Jaborine* (isomeric) antagonistic to pilocarpine and resembling atropine in action. (3) *Pilocarpidine*. (4) *Jaboridine*. (5) A volatile oil. The last two are probably oxidation products of pilocarpine and jaborine, and acting also respectively like them.

Action.—Sialagogue, diaphoretic, and expectorant. *Dose.*—5 to 60 grs. of the powder.

OFFICIAL PREPARATIONS

1. *Extractum Jaborandi Liquidum*.—1 in 1. B.P. *Dose.*—5 to 15 ms.
2. *Tinctura Jaborandi*.—1 in 5. B.P. *Dose.*— $\frac{1}{2}$ to 1 dr.

NON-OFFICIAL PREPARATION

1. *Infusum Jaborandi*.— $\frac{1}{2}$ oz. to 10 ozs. of boiling water for $\frac{1}{2}$ hour. *Dose.*—1 to 2 ozs.

PILOCARPINÆ NITRAS

Pilocarpine Nitrate. $C_{11}H_{16}N_2O_2 \cdot HNO_3$

Source and Characters.—The nitrate of an alkaloid obtained from jaborandi leaves, in white crystalline powder, soluble in 8 or 9 parts of cold water, and slightly in alcohol (90 p.c.).

B.P. Dose.— $\frac{1}{10}$ to $\frac{1}{2}$ gr.

NON-OFFICIAL PREPARATIONS

1. *Pilocarpinæ Hydrochloridum*, B.P.C.—Minute, white deliquescent crystals. *Dose.*— $\frac{1}{10}$ to $\frac{1}{2}$ gr.
2. *Guttes Pilocarpinæ*.—Pilocarpine Nitrate 2 grs., Water 1 oz. Myotic.
3. *Pilocarpine Hair Lotion*.—Pilocarpine Nitrate 2 grs., Quinine Murias 8 grs., Glycerin 2 drs., Aqua Rosæ 6 drs. Mix.
4. *Pilocarpinæ Phenæs, Pilocarpine Carbolate*.—A colourless oily liquid soluble in water and alcohol. A solution 1 gr. in 10 ozs. of 2.75 p.c. of

phenol solution is called **Aseptoline**, an American speciality, and is used in *intermittent fever* and *phthisis* in 1 fl. dr. hypodermically.

5. **Pilocarpinæ Salicylas, B.P.C.**—Small colourless tabular crystals or crystalline powder. *Dose.*— $\frac{1}{2}$ to $\frac{1}{2}$ gr.

6. **Unguentum Pilocarpinæ.**—Pilocarpine Nitrate 4 grs., Vaseline $\frac{1}{2}$ oz., Lanoline $\frac{1}{2}$ oz. Stimulates the *growth of hair*.

7. **Bromocarpin.** *Syn.*—*Pilocarpine et Potassii Bromidi.*—Pot. Bromidum 10, Pilocarpine Hydrobrom. 0.005, Orange Syrup and Glycerin *q.s.* to 100. In *epilepsy* and *nervous affections*. *Dose.*— $\frac{1}{2}$ to 1 oz. daily, 1 to 3 drs. for a child 3 to 7 years old.

PHARMACOLOGY

Jaborandi in many respects resembles physostigma in action (*see* Physostigma).

Externally.—Pilocarpine **contracts the pupil** by stimulating the terminal ends of the third nerve, causing tension of accommodation, and disturbance of vision.

Internally.—Pilocarpine readily enters the circulation and is carried to different structures where it produces definite effects which are described below under separate heads:—

Digestive apparatus.—Within about 10 minutes after administration, jaborandi produces a copious secretion of saliva of almost normal composition by directly stimulating the peripheral ends of the nerves supplying the salivary glandular cells and partly the salivary nerve centre. Therefore it is a **powerful sialagogue** (*see* page 122), the secretion amounting to a pint and a half at times. The salivation is immediately stopped by injection of atropine. The peristaltic movements of the unstriped muscles of the gastro-intestinal canal are increased owing to direct stimulation of the solar plexus. The muscular coat of the intestine is not affected by pilocarpine. The gastric juice and intestinal secretion are also increased. The **biliary secretion** is **unaffected**, but the **spleen contracts**.

Skin.—The next important action is on the **skin**. Within 6 to 10 minutes after the hypodermic injection of pilocarpine nitrate ($\frac{1}{2}$ to $\frac{1}{2}$ gr.) the face, neck and ears become flushed, and drops of perspiration appear upon them, soon extending over the whole surface. The sweating is so profuse as to soak garments and bedclothes, 15 to 20 ozs. may thus be excreted by one diaphoresis. Therefore it is a **powerful sudorific** (*see* page 148). This action is due to the stimulation of the nerve terminations in the glandular cells. It also stimulates the growth of hair, and makes it coarse and black.

Circulatory apparatus.—Both the heart and pulse are accelerated at first, but are soon slowed and depressed. The vessels first dilate, and the blood-pressure falls temporarily; but rises again, and finally falls. Atropine counteracts the slowing of the pulse, but it cannot do so if the vagus is cut; thus showing that pilocarpine depresses the heart by stimulating the peripheral termination of the vagus in the heart.

Respiratory passages.—Jaborandi increases both the nasal and bronchial secretions.

Eyes and ears.—Locally applied, or given by the mouth or subcutaneously, it causes contraction of the pupil. It increases the flow of tears and secretion of cerumen. This contraction of the pupils, which is prevented by the previous use of atropine, is due to stimulation of the endings of the oculo-motor nerve. There is no stimulation of the sphincter muscle itself and the action of the drug in this respect differs from that of physostigmine.

Urinary tract.—Very small doses, frequently repeated, no doubt increase the **flow of urine**, but it is diminished when the sweating is copious. Pilocarpine is eliminated with the urine. Urea is said to be excreted both in the saliva and sweat. By its contractile effect on the bladder it causes suprapubic pain and irresistible desire to pass water.

Body heat and weight.—On account of the excitement of the cutaneous circulation before sweating, there is a slight rise of temperature, but it soon falls during sweating. There is also a reduction of body weight to the extent of seven pounds or more.

Female generative organs.—Pilocarpine causes the uterine muscles to contract, sometimes to such an extent as to cause abortion. It also increases uterine and vaginal mucus, and promotes the secretion of milk.

Summary of actions.—It will be observed that pilocarpine performs **two** most important specific functions, viz.:—(1) The **stimulation of secretion**. (2) the **contraction of the involuntary muscular fibres** due to stimulation of the nerve-endings and not to that of the muscular fibres themselves. **Salivation, diaphoresis and myosis** are the most marked effects. Children are less affected than adults.

Antagonists.—Belladonna and atropine. $\frac{1}{150}$ gr. of atropine given subcutaneously arrests profuse salivation and diaphoresis within 5 to 10 minutes.

THERAPEUTICS

Externally.—To promote the growth of hair, pilocarpine is largely employed in the form of a hair-lotion. In ophthalmic practice, it has been locally applied in **iritis, retinitis, detachment of the retina, glaucoma, &c.**, but it is less active than physostigmine, and its effects more transitory.

Internally.—Pilocarpine has been used in all sorts of diseases, but is now chiefly employed for its diaphoretic action in **uræmia** and **convulsions**, where it may be the means of saving life by the elimination of urea and other products through perspiration. It is of special service in **Bright's disease**. Pilocarpine, in small doses, or the liquid extract (10 ms.) increases diuresis, reduces albumen and blood, and moistens the mouth. When there are **anasarca** and **serous effusions**, $\frac{1}{2}$ to $\frac{1}{4}$ gr. of pilocarpine nitrate produces profuse sweating and salivation, thereby relieving the waterlogged system. The

diaphoresis can be helped by wrapping the patient in warm blankets and giving him warm drinks. It has been used in **bronchitis**, **pertussis**, **asthma**, **diphtheria**, **laryngitis**, **tonsillitis**, **diabetes**, **menorrhœa**, **uterine diseases**, **hydrophobia**, **myxœdema**, &c., with varying results. Ringer considers pilocarpine, when given in $\frac{1}{10}$ gr. doses three times a day, an efficient drug for checking excessive perspiration, as in phthisis. For its antagonistic properties it is used in poisoning by belladonna. Josham considers that $\frac{1}{2}$ gr. subcutaneously injected has a remarkable effect in **calming drunkards**. In **alopecia**, **prurigo**, **urticaria** it has been given with some benefit. Patients suffering from **deafness**, due to **disease of the auditory nerve**, are sometimes benefited by pilocarpine.

Caution.—Sometimes alarming prostration and collapse may follow the hypodermic injection of $\frac{1}{2}$ gr.; and atropine should at once be injected. It should be used with great caution in valvular diseases of the heart, fatty heart, emphysema, pleurisy, and the patient watched. Children are less affected than adults.

JALAPA. Jalap

N.O. *Convolvulacæ*

Habitat.—Mexico.

Source.—The dried tubercles of *Ipomœa purga*.

Characters.—Dark brown; oblong, ovoid or fusiform roots; 1 to 3 in. long; larger ones incised; hard, compact, and heavy. Externally furrowed, wrinkled, with small transverse scars. Internally yellowish-grey or dingy brown. Section exhibits irregular concentric lines. Odour characteristic. Taste sweet at first, acid and disagreeable afterwards.

Identification.—Most easily identified, its appearance is very characteristic. It is distinguished even in powder as its smoky odour and brown colour are very peculiar.

Composition.—(1) *Resin (off.)* 9 to 11 p.c., which again is composed of two glucosides. (a) *Convolvulin*, insoluble in ether, (b) *Jalapin*, soluble in ether. It must be noted that the term *Jalapin* has been applied to the resin of *Sperious Jalap*, which is similar to the true resin of scammony. The nomenclature is misleading.

Action.—Hydragogue purgative.

B.P. Dose.—5 to 20 grs. in cachets or in confection.

Enters into.—Pulv. Scammon. Co. and the

OFFICIAL PREPARATIONS

1. **Extractum Jalapæ.**—A dark brown extract. **B.P. Dose.**—2 to 8 grs. in pill.

2. **Pulvis Jalapæ Compositus.**—1 in 3. Like Dover's powder in appearance. **B.P. Dose.**—20 to 60 grs. in cachets or confection.

3. **Tinctura Jalapæ.**— $1\frac{1}{2}$ p.c. resin. A deep brown liquid. Standardized. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.

4. **Tinctura Jalapæ Compositus (Ind. and Col. Addendum).**—Jalap 262 grs., Scammony 175 grs., Turpeth 88 grs., Alcohol *q.s.* to 1 pint, by percolation. For use in India and Australasian Colonies. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.

JALAPÆ RESINA

Jalap Resin

Source and Characters.—A dark brown, opaque, brittle extract obtained from jalap, readily soluble in alcohol (90 p.c.), not in water. Taste acrid.

Resembles.—Aloes, which is bitter.

B.P. Dose.—2 to 5 grs.

Enters into.—Pilula Scammonii Compositus.

NON-OFFICIAL PREPARATIONS

1. **Sapo Jalapinus.**—Resin 4, Soap 4, Alcohol 8 by weight. Evaporate to 9. *Dose.*—2 to 6 grs.

2. **Jalapin (British).**—A whitish powder, containing 90 p.c. of convulvin. *Dose.*—1 to 5 grs. Mayer's Jalapin, which is cheaper, consists chiefly of Orizabin, the principal constituent of Spurious Jalap. It is a less active purgative and is identical with Scammonin. Jalapin is said to be the active principle of the proprietary remedy known as "*Taman Indien*."

PHARMACOLOGY

Internally.—Jalap closely resembles scammony in actions with this difference, that (1) it is **less irritant** and **contracts less** violently the intestinal muscular fibres, and therefore causes less griping; and (2) it produces a **greater stimulation** of the intestinal glands, and is therefore **more hydragogue**. It does not purge unless in contact with the bile. *Small doses* have a **laxative** effect, but large ones produce several watery stools attended with pain and griping. Its action is entirely local, for it does not purge when subcutaneously injected. It has a feeble **cholagogue** action.

THERAPEUTICS

Internally.—Being a **hydragogue purgative**, Pulv. Jalap. Co. is employed in drawing off water in **dropsy**, **ascites**, **anasarca**: from whatever causes they may arise. It is also used in **obstinate constipation**, and is a **revulsant** in **congestion** of the **brain**, **apoplexy**, and **engorgement** of the **right heart**. Jalap is an excellent purgative in **Bright's disease** and **uræmia**. The resin in small doses can be given in **habitual constipation**. It should not be prescribed where the bowels are inflamed or liable to inflammation.

JUNIPERI OLEUM

Oil of Juniper. N.O. *Coniferae*

Syn. I. V.—*Aarar Ká tel*, Hind. *Hab-ul-arar Ká tel*, Bomb.

Habitat.—North of Europe and North-west Himalaya.

Source.—The oil distilled from the full-grown unripe green fruit of *Juniperus communis*.

Characters.—Colourless or pale greenish-yellow; odour characteristic; taste aromatic bitter. Sp. gr. 0.865 to 0.890. *Solubility.*—1 in 20 of alcohol (90 p.c.).

Composition.—Contains (1) a hydrocarbon. *Terpene* ($C_{10}H_{16}$) isomeric with oil of turpentine and which by contact with water yields white crystalline hydrous compound $C_{10}H_{16}H_{20}$; (2) *Polymeric hydrocarbon* ($C_{20}H_{32}$).

Action.—Stimulating diuretic, carminative and antispasmodic.

B.P. Dose.— $\frac{1}{2}$ to 3 ms.

OFFICIAL PREPARATION

1. **Spiritus Juniperi.**—1 in 20. If not clear, shake with powdered tale and filter. **B.P. Dose.**—20 to 60 ms. *Enters into.*—Mistura Creosoti.

PHARMACOLOGY

Internally.—Oil of juniper resembles oil of turpentine in its action, but it is a more powerful **renal stimulant** and **diuretic**, and is more agreeable to the stomach. In large doses, it **excites the genital organs** like cantharides, causing strangury and priapism. It is absorbed into the blood and is excreted with the urine, to which it imparts an odour of violets. The diuretic effect is observed in dropsy whilst in health it is said to diminish the urine secreted.

THERAPEUTICS

Internally.—Sometimes it is used as a stomachic, stimulant and antispasmodic, but it is chiefly employed as a diuretic in **cardiac** and **hepatic dropsy**, and in some forms of **chronic Bright's disease**. It should not be used in acute renal affections. It is best given with salines. Gin and Hollands contain it and they can be used as alcoholic beverages in the above diseases.

KALADANA. Kaladana

N.O. *Convolvulaceæ*. (*Ind. and Col. Addendum*)

Syn. B.P.—*Pharbitis Nil*. **Syn. I. V.**—*Kálú dāná*, Beng., Hind.

Habitat.—India and Eastern Colonies.

Source.—The dried seeds of *Ipomœa hederacea*.

Characters.— $\frac{1}{8}$ in. long and wide, in segments of spheres. Black throughout, brown and hairy only at the hilum. Taste sweetish at first, then acrid.

Composition.—*Pharbitisin*, a resin, about 8 p.c. It resembles the resin of jalap (*convolvulin*), and corresponds to it in chemical properties.

Action.—Mild purgative.

B.P. Dose.—30 to 50 grs. in powder.

OFFICIAL PREPARATIONS

1. **Pulvis Kaladanæ Compositus.**—Kaladana 5, Acid Pot. Tartrate 9, Ginger 1. **B.P. Dose.**—20 to 60 grs.

2. **Tinctura Kaladanæ.**—1 in 5 of alcohol (70 p.c.). **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.

KALADANÆ RESINA*Kaladana Resin*

Source and Characters. A resin obtained from *kaladana* seeds. In brownish opaque fragments translucent at the edges; brittle, breaking with a resinous fracture of a disagreeable odour, specially when warmed.
B.P. Dose.—2 to 8 grs.

PHARMACOLOGY AND THERAPEUTICS

The action and uses of *kaladana* and its resin are the same as those of *Jalap* (*q.v.*), but it is a milder remedy. In small doses it is a gentle purgative, but in larger ones, especially in the form of *Pulv. Kaladane Co.* it has a drastic action and can therefore be used with benefit as a derivative in all cases of dropsy.

KAOLINUM. Kaolin

Source.—A native aluminium silicate, powdered, and freed from gummy particles by elutriation.

Characters.—A soft whitish powder insoluble in water or in dilute acids.

Enters into.—*Pilula phosphoricum.*

NON-OFFICIAL PREPARATION

1. **Ung. Kaolini.**—Vaseline 1, Hard Paraffin 1, melt, and add Kaolin 1, stir till cold. An emollient application to abraded surfaces and a useful excipient for silver nitrate, potassium permanganate, and bichromate pills (*see p. 86*).

USES

Besides its use as an **excipient**, it can be employed as a dusting powder in **intertrigo**, **weeping eczema**, &c.

KAVÆ RHIZOMA. Kava Rhizome

N.O. Piperaceæ. (Ind. and Col. Addendum)

Syn.—"Kava-Kava."

Habitat.—Australasian Colonies.

Source.—The dried decorticated rhizome, without roots, of *Piper methysticum*.

Characters.— $\frac{1}{2}$ to 2 in. thick, in irregular fragments of a pale greyish colour.

Composition.—(1) *Kavalin* or *Methysticin* about 1 p.c., a neutral crystalline principle allied to "Piperin." (2) Two resins, one of which is *Kawine*. (3) An essential oil.

B.P. Dose.—5 to 10 grs.

OFFICIAL PREPARATION

1. **Extractum Kavæ Liquidum.**—1 in 1 of alcohol (90 and 45 p.c.).
B.P. Dose.—30 to 60 ms.

PHARMACOLOGY AND THERAPEUTICS

Kava is a useful bitter tonic with an agreeable taste, and a stimulant. Taken in small doses it sharpens the mental faculties and removes fatigue and languor, therefore it resembles caffeine. In larger doses it acts upon the spinal cord, when it causes an ataxic gait, the intellectual faculties remaining unaltered. As a local anæsthetic it acts like cocaine, and when applied to a mucous membrane it produces burning followed by anæsthesia. In toxic doses Kava produces general anæsthesia and paralysis by its depressing action on the cord and the peripheral endings of the sensory nerves. This action is mainly due to the resin *kawine* present in it. It is a diuretic, and many authors claim for it an alterative action upon the **genito-urinary organs**. It is said to be useful in **gonorrhœa**, especially when accompanied and complicated with **gout, gleet and cystitis**. In the form of an infusion it is taken as an intoxicating liquor which it is said has an antisymphilitic virtue.

The best form for administration is the liquor extract.

KINO. Kino

N.O. *Leguminosæ*

Syn. I. V.—*Pit-sal*, Beng. *Bija*, *Bijasar*, Hind.

Habitat.—Malabar in India.

Source.—The juice, obtained from incisions in the trunk of *Pterocarpus marsupium*, evaporated to dryness.

Characters.—Small, angular, glistening, opaque, reddish-black, brittle fragments; transparent and ruby-red at the edges, inodorous. Astringent, tinging the saliva red. **Solubility.**—Partially in cold water, almost entirely in alcohol (90 p.c.).

Composition.—(1) *Kino-tannic acid*, 75 p.c. (2) *Kinoic acid*, a neutral crystalline substance. (3) *Pyrocatechin*. (4) *Kino red*. (5) *Gum*.

Incompatibles.—Alkalis, mineral acids, metallic salts, carbonates, gelatin.

Action.—A strong intestinal astringent.

B.P. Dose.—5 to 20 grs. in cachets.

Enters into.—Pulv. Catechu Co. and the

OFFICIAL PREPARATIONS

1. **Pulvis Kino Compositus.**—1 opium in 20. **B.P. Dose.**—5 to 20 grs.
2. **Tinctura Kino.**—1 in 10. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.

NON-OFFICIAL PREPARATIONS

1. **Trochisci Kino (T.H.).**—2 grs. in each, with Black-currant paste.

KINO EUCALYPTI

Eucalyptus Kino (Ind. and Col. Addendum)

Syn. B.P.—Botany Bay kino.

Habitat.—Australasian Colonies.

Source.—An exudation from the stem of various species of eucalyptus, having the characters and answering to the tests for kino.

B.P. Dose.—5 to 20 grs. in powder.

PHARMACOLOGY AND THERAPEUTICS

Internally.—Kino resembles catechu and krameria in action. As it contains 75 p.c. of **kino-tannic acid**, it is a powerful intestinal astringent, and a useful remedy in **diarrhoea** and **dysentery**. In relaxed conditions of the throat, the lozenge affords great relief. Sometimes it is given in **hæmorrhages** as a substitute for tannic acid.

Prescribing hints.—Tincture kino, made in the ordinary way, is apt to gelatinize. This may be prevented by adding the kino to boiling water, keeping the mixture at 100° C. for 12 hours. It is then allowed to cool and the alcohol added, after which it is set aside for 12 hours and then filtered.

KRAMERIÆ RADIX

Krameria Root. N.O. *Polygalaceæ*

Syn. B.P.—Rhatany Root.

Source.—The dried root of (1) *Para Rhatany*, a species of *krameria* attributed to *Krameria argentea*; or of (2) *Peruvian Rhatany*, *Krameria triandra*.

Characters.—(1) *Para*.—Cylindrical pieces, purplish-brown, smooth thick bark, marked by deep cracks, and adhering firmly to the reddish-brown coloured wood. Fracture short. (2) *Peruvian*.—Dark reddish-brown, readily separable from yellowish woody axis. Bark thinner than of *Para*, rough and scaly. The bark of both kinds has a strong astringent taste, and tinges saliva red.

Composition.—(1) *Rhatanhia-tannic acid*, 20 p.c. (2) *Rhatanhia red*, the colouring matter. (3) *Rhatannin*, neutral substance.

Incompatibles.—Alkalis, lime water, iron, lead salts, and gelatin.

Action.—A powerful astringent and tonic. **Dose.**—20 to 60 grs. in powder.

Enters into.—Pulv. Catechu Co. and the

OFFICIAL PREPARATIONS

1. **Extractum Krameris.** *Syn. B.P.*—*Extract of Rhatany*.—A deep reddish-brown solid extract. **B.P. Dose.**—5 to 15 grs, in pill or with chalk mixture.

2. **Infusum Krameris.** *Syn. B.P.*—*Infusion of Rhatany*.—1 in 20 ($\frac{1}{2}$ hour). **B.P. Dose.**— $\frac{1}{2}$ to 1 oz.

3. **Liquor Krameris Concentratus.**—1 in 2. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.

4. **Tinctura Krameris.** *Syn. B.P.*—*Tincture of Rhatany*.—1 in 5. A deep red liquid. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.

5. **Trochiscus Krameris.** *Syn. B.P.*—*Rhatany Lozenge*.—1 gr. in each.

6. **Trochiscus Krameris et Cocainis.** *Syn. B.P.*—*Rhatany and Cocaine lozenge*.—1 gr. extract and $\frac{3}{10}$ gr. Cocaine Hydrochloride in each.

NON-OFFICIAL PREPARATIONS

1. **Ext. Krameris Fluidum, U.S.**—Rhatany root 1, exhaust with Dilute Alcohol and Glycerin to make 1 of fluid extract. *Dose.*—15 ms.
2. **Gossypium Krameris, T.H.**—Tincture of Rhatany $\frac{1}{2}$ oz., Glycerin 10 ms., Cotton-wool 60 grs. Saturate and dry.
3. **Suppositorium Krameris.**—Extract of Rhatany 8 grs., Morph. Hyd. $\frac{1}{10}$ gr., Cacao-Butter basis.
4. **Syr. Krameris, B.P.C., U.S.**—Fluid Extract of Krameria 45, Syrup 55.

PHARMACOLOGY AND THERAPEUTICS

Internally.—Rhatany is a powerful **astrigent**, because of the tannic acid it contains. The powdered root forms an important ingredient in many dentifrices and the tincture in mouth-washes. A teaspoonful of tincture in 1 oz. of water or the infusion of the root makes a good gargle in **relaxed sore throat, spongy and ulcerated gums and mercurial stomatitis**. Krameria and cocaine lozenge is very efficacious in **sore throat**. The infusion may also be used in **gonorrhoea and leucorrhoea**. Krameria is one of the best intestinal astringents in **diarrhoea**, and may be employed as well, in **hæmatemesis and melæna**. As a remote hæmostatic it is now seldom used.

LAUROCERASI FOLIA

Cherry Laurel Leaves. N.O. *Rosaceæ*

Habitat.—Britain (cultivated).

Source.—The fresh leaves of *Prunus laurocerasus*.

Characters.—Thick, coriaceous, short petioled, oblong or obovate, 5 to 7 in. long, tapering towards each end, recurved at the apex, distantly but sharply serrate, dark green, smooth, shining above, paler below. Midrib prominent, with glandular depressions on either side. Inodorous, bitter almond odour when bruised.

Composition.—(1) *Laurocerasin*, a glucoside; this is identical with amygdalin. By the same changes as in the case of amygdalin, in the presence of moisture, *hydrocyanic acid, glucose*, and an *essential oil* are formed (see p. 237). (2) *Emulsin*.

Incompatibles and antidotes.—The same as of dilute hydrocyanic acid (see p. 195).

OFFICIAL PREPARATION

1. **Aqua Laurocerasi.**—1 lb. to 1 pint. Should contain $\frac{1}{10}$ p.c. HCN. Should be standardized if necessary. It requires also to be tested occasionally as it loses strength by keeping. **Sedative.** **B.P. Dose.**— $\frac{1}{2}$ to 2 drs.; 20 ms. equal to 1 m. of hydrocyanic acid dil.

PHARMACOLOGY AND THERAPEUTICS

Aqua laurocerasi possesses the properties of acid. hydrocyanic. dil., but, as its strength is apt to vary on account of the volatilization of the prussic acid it contains, it is not generally used instead of the acid; although often prescribed as a flavouring agent.

LAVANDULÆ OLEUMOil of Lavender. N.O. *Labiatae*

Source.—The oil distilled from the flowers of *Lavandula vera* cultivated in England and the western shores of the Mediterranean.

Characters.—Pale yellow or colourless with fragrant odour of flowers and a pungent bitter taste. Sp. gr not below 0.885. **Solubility.**—1 in 4 of alcohol (70 p.c.). **Impurities.**—Oils of spike and turpentine.

Composition.—(1) *Linalool*, an alcohol and oxidation product of terpene myrcene. (2) *Linalool acetate*, the principal constituent of oil of bergamot. The value of the oil depends upon the latter ingredient, which should be 30 p.c. (3) Pinene $C_{10}H_{16}$ is present in some samples, but is not a constant constituent.

Action.—Stimulant, carminative.

B.P. Dose.— $\frac{1}{2}$ to 3 ms. Rarely used alone.

Enters into.—Lint. Camph. Ammon. and the

OFFICIAL PREPARATIONS

1. **Spiritus Lavandulæ.**—1 in 10. **B.P. Dose.**—5 to 20 ms. on sugar.
2. **Tinctura Lavandulæ Composita.**—45 ms. to 1 pint. A bright crimson liquid. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr. for colouring mixtures. **Enters into.**—Liqr. Arsenicalis, to prevent formation of moulds.

PHARMACOLOGY AND THERAPEUTICS

Externally.—Oil of lavender is used to perfume liniments, and the tincture to colour lotions. It is an ingredient of smelling salts and lavender water.

Internally.—Like other aromatic oils, it is a stimulant, carminative and antispasmodic, and can be used in **flatulence, colic, hypochondriasis, hysteria** and **neurasthenic affections**. But its chief use is confined to colouring and flavouring purposes.

LECITHIN. B.P.C. (*Non-official*)

Syn.—Ovo-Lecithin.

Source.—It is a normal constituent of brain substance and yolk of egg.

Characters.—A yellowish wax-like substance, insoluble in water.

Composition.—It is *choline-di-stearo-glycerophosphate*.

Action.—Nerve stimulant. **Dose.**—Internally, 3 to 5 grs.; hypodermically, $\frac{1}{4}$ to 2 grs. in sterile olive oil.

PHARMACOLOGY AND THERAPEUTICS

Causes increase in body-weight and improves general nutrition. Used in **phosphaturia, neurasthenia, diabetes, incipient tuberculosis, rickets**, and **osteomalacia**; also in **tabes dorsalis** and **general paralysis**.

It should be prescribed either in the form of tabloid or granules.

LIMONIS CORTEX

Lemon Peel. N.O. *Rutaceæ***Habitat.**—South of Europe.**Source.**—The fresh outer part of the pericarp of the fruit of *Citrus medica*, var. β *Limonum*.**Characters.**—Pale yellow, rough outside from glands, containing volatile oils embedded in it; inner surface should have a thin white portion. Odour characteristic, fragrant. Taste warm, aromatic bitter.**Composition.**—(1) *Volatile Oil*, *Oleum Limonis* (off.). (2) *Hesperidin*, a bitter principle.**Enters into.**—Inf. Aurantii Co., Inf. Gent. Co., and the

OFFICIAL PREPARATIONS

1. **Oleum Limonis.**—A pale yellow, bitter aromatic *volatile oil* obtained from fresh lemon peel; chiefly used for flavouring. Sp. gr. 0.857 to 0.860.**B.P. Dose.**— $\frac{1}{2}$ to 3 *ms.* *Enters into.*—Lin. Pot. Iod. cum Sapone, Spt. Ammon. Aromat., Tr. Guaiaci Ammoniata, and Tr. Valer. Ammon.2. **Succus Limonis.**—30 to 40 grs. of citric acid in 1 oz (*see* p. 189).3. **Syrupus Limonis.**—1 peel and 25 juice in 65 (*see* p. 190).4. **Tinctura Limonis** (Altered).—1 in 4. Sherry-coloured. **B.P. Dose.**— $\frac{1}{2}$ to 1 *dr.*

NON-OFFICIAL PREPARATION

1. **Citral.**—An aldehyde having fifteen times more flavouring power than the oil.

PHARMACOLOGY AND THERAPEUTICS

Internally.—The actions of lemon peel are similar to those of orange peel. The oil is a stimulant and carminative and can be used to expel intestinal flatus. In practice both of them are used for flavouring purposes. Lemon juice is antiscorbutic. Whitla says that the decoction of sliced fresh unpeeled lemon is a valuable antiperiodic in malaria.

LINUM. Linseed

N.O. *Lineæ***Syn.**—Flax. **Syn. I. V.**—*Tisi*, *Mashina*, Beng. *Alsi*, Hind.**Habitat.**—Britain, Holland, Russia, and India.**Source.**—The dried ripe seeds of *Linum usitatissimum*.**Characters.**—Small, brown, glossy, nearly flat, $\frac{1}{8}$ to $\frac{1}{4}$ in. long, ovate, obliquely pointed, surface glabrous. Internally yellowish-white with two oily cotyledons. *Envelope, or testa, mucilaginous.* Three varieties are seen in Calcutta, brown, white, and red.**Composition.**—(1) *Mucilage* in the testa. (2) *Fixed oil* (off.), which consists of *glyceryl* combined with *linoleic acid*, 25 to 30 p.c.**Action.**—Demulcent, emollient, and nutrient.

OFFICIAL PREPARATIONS

1. **Linum Contusum.** *Syn.*—*Linseed Meal.*—Linseed reduced to coarse powder, should be recently prepared. Used in making **Cataplasma Lini.** (*See Cataplasms*, p. 67.)

2. **Oleum Lini.**—The oil expressed from linseed at ordinary temperatures. Viscid, yellow, with faint odour and bland taste. Boiled and Dutch oils are to be avoided. Fresh oil should, if possible, be used.

PHARMACOLOGY AND THERAPEUTICS

Externally.—Contused linseed in the form of a warm poultice is used to disperse threatening **abscesses, boils, carbuncles, lymphangitis** or **local inflammations**, by dilating the local blood-vessels and relaxing the tissues, thereby relieving the tension and pain caused by pressure over the periphery of the sensory nerves. But if the poultice is too hot it increases pain and tension. If the leucocytes have already passed through the coats of the vessels, and **suppuration** has commenced, a warm poultice helps it to reach the surface. Hot linseed meal poultice is an excellent, mild, continuous **counter-irritant** for **deep-seated inflammations**, such as **pneumonia, bronchitis, broncho-pneumonia, pleuritis, pericarditis, peritonitis, arthritis, pelvic cellulitis**, &c. The counter-irritant effect can be greatly increased by dusting powdered mustard over the surface of the poultice, or mixing it (1 in 16) with the meal. Iced poultices may also be employed in **pneumonia** or other local inflammations.

The oil makes a good emollient application to **burns and scalds** in the form of **carron oil** (*see* page 300). The oil can also be used as an **enema** (1 lb.) in impacted conditions of the rectum and lower colon.

Internally.—Linseed tea, *i.e.* the infusion of linseed, especially when combined with lemon, is a reputed domestic demulcent drink in **throat cough**. Possibly it has a slight expectorant effect. The ordinary formula for linseed tea is linseed $2\frac{1}{2}$ drs., liquorice root 1 dr., boiling water 10 oz., infuse for two hours. This can be taken sweetened with sugar. It has a slightly diuretic action and a patient with an **irritable bladder** or suffering from **gonorrhoea** often finds relief by copious linseed drinks.

LITHII CARBONAS

Lithium Carbonate. Li_2CO_3

Source.—Obtained from native silicates of lithium.

Characters.—In white powder or minute crystalline grains. *Solubility.*—1 in 70 of water, insoluble in alcohol (90 p.c.). *Impurities.*—Lime, alumina, &c.

Action.—Antacid, diuretic and antilithic.

B.P. Dose.—2 to 5 grs.

LITHII CITRAS. Lithium Citrate

Source.—Prepared by saturating citric acid with lithium carbonate.

Characters.—A white crystalline deliquescent salt. *Solubility.*—1 in 2 of water.

Action.—The same as of carbonate.

B.P. Dose.—5 to 10 grs. freely diluted in aerated water.

OFFICIAL PREPARATION

1. **Lithii Citras Effervescens.**—1 in 20. A white granular powder.
B.P. Dose.—60 to 120 grs.

NON-OFFICIAL PREPARATIONS OF LITHIUM

1. **Lithii Benzoas, U.S.**—A white crystalline powder, soluble 1 in 4 of water. Antilithic. *Dose.*—2 to 10 grs.
2. **Lithii Bromidum, B.P.C., U.S.**—A white granular deliquescent salt, soluble 1 in 1 of water. Contains 91 p.c. of bromine as against 67 p.c. in potassium bromide. A good *hypnotic in gout*. Used in *insomnia, epilepsy, Bright's disease*. *Dose.*—5 to 15 grs.
3. **Lithii Guaiacas, B.P.C.**—Consists of Lithium Oxide 1, Guaiacum Resin 3. Introduced by Garrod for *chronic gout and rheumatism*. *Dose.*—5 grs. twice daily.
4. **Lithii Hippuras.**—White minute crystals, soluble in water. Powerful antilithic. In *uric acid gravel, gout, and rheumatism*. *Dose.*—5 to 20 grs.
5. **Lithii Iodidum, B.P.C.**—White powder, soluble in water. *Dose.*—1 to 5 grs.
6. **Lithii Salicylas, U.S.**—A deliquescent white powder. *Dose.*—5 to 20 grs.
7. **Lithii Tartras Acidus.**—Finely crystalline. Specially useful in *gouty cases* with gum affections. *Dose.*—5 to 20 grs.
8. **Lithio-piperazine.**—A powerful solvent of uric acid in 10 gr. doses.
9. **Lithii Citras Laxativus Efferv. B.P.C.**—Sodium Phosphate 30 p.c., Lithium Citrate 10 p.c. *Dose.*—60 to 120 grs.
10. **Uricedin.**—Soluble brownish-yellow granules containing citrate of lithium with citrates and sulphates of alkalis. Used in *uric acid diathesis, urinary calculi, gout, and articular rheumatism*. *Dose.*—1 to 2 drs.
11. **Uropherin.** *Syn.*—*Lithium-Diuretin.*—A white powder, soluble in water, powerful diuretic in *Bright's disease* and *cardiac dropsy*. *Dose.*—5 to 15 grs.

PHARMACOLOGY

Internally.—Lithium salts are readily absorbed and are believed to increase the **alkalinity of the blood**. They resemble the corresponding potassium salts in their actions: with this difference that, (1) they are powerful **solvents of uric acid**, by combining with it and forming *urate of lithium*, which is very soluble, (2) they are *stronger diuretics*, and, (3) they are **less depressant to the heart**, in which respect they more closely resemble sodium than potassium salts. They render the **urine alkaline**, holding in solution excess of uric acid,

therefore their prolonged use helps to dissolve **uric acid calculi**. Hence, they are **urinary lithontriptics**. They are eliminated by the urine. Recent investigations have thrown considerable doubt upon the value of lithia as a solvent of uric acid in the human body. In a test-tube it is a beautiful solvent, but when taken internally it forms a nearly insoluble triple phosphate with phosphate of soda, which not only prevents its action on uric acid but puts out of use a certain amount of phosphate, which is itself a solvent for uric acid. Moreover, as a matter of fact, Haig has shown that the administration of lithia actually decreases the elimination of uric acid by the urine.

THERAPEUTICS

Externally.—A lotion of the carbonate ($1\frac{1}{2}$ drs. to 1 pint) applied on lint and covered with gutta-percha is a useful local application for removing gouty inflammation of joints, gouty ulcers and deposits.

Internally.—Lithium salts were formerly considered to be of special value in both **acute** and **chronic gout**, by helping the solution of biurate of sodium, and eliminating it. For its solvent action on uric acid, they were given in **uric acid diathesis** and **uric acid calculi**, but the recent observations alluded to above have now rather discredited lithium as a remedy for gout and lithiasis. The salts should be freely diluted before administration. The carbonate 5 grs. given with aerated water 10 ozs. does not irritate the stomach, but lithii citras effervescens is more agreeable, although it becomes a carbonate in the blood. Up to 1 oz. of the citrate may be given daily.

LOBELIA. *Lobelia*

N.O. *Lobeliaceæ*

Habitat.—North America.

Source.—The dried flowering herb of *Lobelia inflata*.

Characters.—Stems angular, channelled, with narrow wings; purplish, hairy, scarred. Leaves alternate, toothed, hairy. Capsules inflated, two-celled, containing brown seeds. Odour irritating. Taste after chewing, burning and acid.

Composition.—(1) *Lobeline*, a volatile liquid oily alkaloid. (2) *Lobelic acid* remains united with lobeline. (3) *Lobelacrin*.

Incompatibles.—Caustic alkalis, which decompose lobeline.

Action.—Depressant, antispasmodic, diaphoretic, and diuretic.

OFFICIAL PREPARATION

1. *Tinctura Lobelias Æthereæ*.—1 in 5. B.P. Dose.—5 to 15 ms.

NON-OFFICIAL PREPARATIONS

1. **Lobeline Sulphate**.—In deliquescent, yellow, friable pieces, soluble in water. Used in *asthma*, *dyspnœa*, *whooping-cough*, and *spasmodic neuroses*.
Dose.— $\frac{1}{6}$ gr. or more with caution.

2. **Tinct. Lobeliae, B.P. 85.**—2½ ozs. to 1 pint. By maceration and percolation with proof spirit. *Dose.*—10 to 30 ms.

PHARMACOLOGY

The action of lobelia resembles that of tobacco in many respects.

Internally. **Gastro-intestinal canal.**—Whether absorbed by the skin or the stomach, lobelia, in large doses, produces **gastro-intestinal irritation**, causing vomiting, purging and great prostration. The vomiting is probably due to the primary stimulation of the vomiting centre.

Heart and circulation.—Lobeline enters the circulation. Observations on the frog's heart show that it first stimulates and then **depresses** and finally arrests its action in diastole. **Blood-pressure falls.** This is ascribed to its influence over the heart and the paralysis of the vaso-motor centre.

Respiratory passage.—It is a powerful **respiratory sedative**. It slows respiration in small doses, and in large ones powerfully depresses the respiratory centre so that **death** takes place from **respiratory failure** before the stoppage of the heart. It relaxes the bronchial muscles, hence it is a **bronchial antispasmodic**.

Nervous system and muscles.—The convulsions are secondarily affected only by toxic doses, when coma, and sometimes convulsions, may occur. Besides its depressing effects on the cardiac, respiratory and vaso-motor centres, it lowers the activity of the motor centre of the cord, causing **relaxation of muscles**.

Elimination.—Lobelia is probably thrown off by the skin and kidneys, producing **diaphoresis** and **diuresis**.

Toxic action.—Poisoning is rare. When it occurs, it is usually accompanied by those symptoms already mentioned above, i.e. gastro-intestinal irritation, cardiac and respiratory depression, collapse, coma, cold perspiration, sometimes convulsions and death.

Antidotes.—Pump, emetics, tannin, later on stimulants, as brandy, ammonia, ether, strychnine $\frac{1}{10}$ gr. hypodermically, morphine or opium in small doses, external warmth, friction, sinapisms, horizontal position.

THERAPEUTICS

Internally.—Therapeutically it is used like stramonium. For its powerful bronchial antispasmodic action it is very often used in **asthma**, either (1) in full doses ($\frac{1}{2}$ to 1 dr.) of the tincture every one or two hours, until nausea is experienced, or relief is obtained; or (2) in 10 to 15 ms. every 10 or 15 minutes until the dyspnoea gives way. It must be noted that large doses sometimes cause great depression. If there is more or less dyspnoea throughout 24 hours the patient must have 10 ms. thrice daily, besides a few extra doses during the paroxysm. Often speedier relief is obtained by combining it with

bromides, iodides, or morphine, as in the formula used by the writer in bronchial asthma always with success.—Tr. Lobel. \AA ther. \AA iii, Pot. Iodide \AA ii, Pot. Bromide \AA iii, Aqua Chloroformi ad \AA viii. M. ft. mist. $\frac{1}{2}$ part every one or two hours until relieved.

It is used in **spasmodic bronchitis**, and **whooping-cough**, relieving the paroxysmal dyspnoea and spasms. It has also been employed in **cough** and **laryngismus stridulus**.

LUPULUS. Hops

N.O. *Cannabineæ*

Syn. B.P.—*Humulus*.

Habitat.—England, Kashmir, and Dera Dun.

Source.—The dried strobiles of *Humulus lupulus* collected from cultivated plants.

Characters.—Strobiles $1\frac{1}{2}$ in. long, oblong-ovoid or rounded, consisting of imbricated greenish-yellow, membranous stipules and bracts, attached to a hairy axis. Odour aromatic. Taste bitter, aromatic, and astringent.

Composition.—(1) *Lupulin*, a liquid alkaloid. (2) *Lupulinic acid*. (3) *Valerol*, an aromatic oil giving odour. (4) *Resin*. (5) *Tannin*. (6) *Sesquiterpene*.

Incompatibles.—Mineral acids and metallic salts.

OFFICIAL PREPARATIONS

1. **Infusum Lupuli.**—1 in 20 ($\frac{1}{4}$ hour). **B.P. Dose.**—1 to 2 ozs.
2. **Tinctura Lupuli.**—1 in 5. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.

NON-OFFICIAL PREPARATION

1. **Extractum Lupuli. B.P. 1885.** *Dose.*—5 to 15 grs. in pill.

LUPULINUM. Lupulin

Source and Characters.—A granular brownish-yellow powder obtained from the dried strobiles of *Humulus lupulus*.

Action.—Aromatic, tonic, and sedative.

B.P. Dose.—2 to 5 grs.

NON-OFFICIAL PREPARATIONS

1. **Ext. Lupulini Fluidum, U.S.** *Dose.*—10 to 30 ms.
2. **Oleoresina Lupulini, U.S., B.P.C.** *Dose.*—2 to 5 grs.
3. **Tinctura Lupulini, U.S.**—1 in 8. *Dose.*—10 to 60 ms.

PHARMACOLOGY

Internally.—Hops belong to the class of aromatic bitters, and are therefore **stomachic** and **tonic**, due to the aromatic oil and lupulinic acid, and bitter principle, they contain. They have also slight **hypnotic** property. Whether this is due to the aromatic oil or the alkaloid is not yet known. The stimulant effect of the aromatic oil is greatly enhanced by alcohol as in beer.

THERAPEUTICS

Internally.—As a remedy hops are rarely used, but in the form of pure bitter ales, they are extremely serviceable in helping digestion and promoting appetite during convalescence, or where digestion has become enfeebled from any other cause. The official preparations are sometimes given with benefit in **nymphomania**, **satyriasis**, **nervous irritability**, **delirium**, &c. Sometimes they check the morbid desire for drink.

A hop pillow (stuffed with hops instead of cotton) is often very useful as a remedy for insomnia.

MAGNESIA LEVIS

Light Magnesia. MgO

Syn. B.P.—Light Calcined Magnesia, Light Magnesium Oxide.

Source.—Prepared by exposing light magnesium carbonate to a dull red heat.

Characters.—A light bulky white powder, $3\frac{1}{2}$ times lighter than heavy magnesia.

B.P. Dose.—5 to 30 grs. for repeated administration ; 30 to 60 grs. for a single dose.

Enters into.—Pulv. Rhei Co.

MAGNESIA PONDEROSA

Heavy Magnesia. MgO

Syn. B.P.—Heavy Calcined Magnesia, Heavy Magnesium Oxide.

Source.—Prepared by exposing heavy magnesium carbonate to a dull heat.

Characters.—A white powder insoluble in water, but readily dissolved by acids.

Incompatibles.—All acids.

Action.—Antacid, laxative, and antilithic.

B.P. Dose.—The same as light magnesia.

MAGNESII CARBONAS LEVIS

Light Magnesium Carbonate. $3(MgCO_3), Mg(HO)_2, 4H_2O$

Source.—Prepared by mixing *cold dilute* solutions of magnesium sulphate and sodium carbonate, boiling for 15 minutes, and filtering, washing, and drying: $4MgSO_4 + 4Na_2CO_3 + 5H_2O = 3(MgCO_3), Mg(HO)_2, 4H_2O + 4Na_2SO_4 + CO_2$.

Characters.—A light white powder consisting of amorphous particles and slender prisms. *Solubility.*—1 in 2500 of cold water.

B.P. Dose.—5 to 30 grs. for repeated administration ; 30 to 60 grs. for a single dose.

MAGNESII CARBONAS PONDEROSUSHeavy Magnesium Carbonate. $3(\text{MgCO}_3), \text{Mg}(\text{HO})_2, 4\text{H}_2\text{O}$ **Source.**—Prepared as the light carbonate, but with *strong boiling* aqueous solutions.**Characters.**—A white granular powder. **Impurities.**—Lime, sulphates.**Action.**—Antacid, purgative.**B.P. Dose.**—The same as light carbonate.**Enters into.**—The preparation of Magnesia Ponderosa, Troch. Bismuthi Co. and the**OFFICIAL PREPARATION**

1. **Liquor Magnesii Carbonatis.** *Syn. B.P.*—*Fluid Magnesia.*—10 grs. in 1 oz. Antacid and agreeable aperient, less liable to form concretions in the colon than lighter preparations. **B.P. Dose.**—1 to 2 ozs., $\frac{1}{2}$ dr. for a child 1 year old.

NON-OFFICIAL PREPARATIONS

1. **Mistura Alba, B.P.C.**—Mag. Carb. 1 dr., Mag. Sulph. 6 drs., Peppermint Water 6 ozs. *Dose.*— $\frac{1}{2}$ to 1 oz. as an aperient.

2. **Liquor Magnesii Bromidi.**—Neutralize Acid. Hydrobromic. Dil 20 ozs. (10 p.c.) with Magnesium Carbonate 1 oz.; filter. *Dose.*—1 to 2 drs. in insanity.

3. **Magnesium Citrate** (Merck).—A soluble salt. *Dose.*—30 to 125 grs.

4. **Liquor Magnesii Citratis, U.S., B.P.C.** *Syn.*—*Lemonade Purgative.*—Magnesium Carbonate 15, Acid Citric 33, Syrup of Citric Acid 60, Pot. Bicarb. (cryst.) 2·5, Water to 360. A pleasant refrigerant draught and saline aperient. *Dose.*—5 to 10 ozs.

5. **Red mixture** (Dr. Goodeve's).—Mag. Carb. Pond. 30 grs., Rhubarb 10 grs., Spt. Ammon. Aromat. 30 ms., Ol. Anisi 2 drops, Water to 2 ozs. Mix. *Dose.*—One teaspoonful every 3 or 4 hours till bowels operate.

MAGNESII SULPHASMagnesium Sulphate. $\text{MgSO}_4, 7\text{H}_2\text{O}$ **Syn. B.P.**—Epsom salts.**Source.**—Prepared by the interaction of native magnesium carbonate and diluted sulphuric acid, $\text{MgCO}_3 + \text{H}_2\text{SO}_4 = \text{MgSO}_4 + \text{H}_2\text{O} + \text{CO}_2$; or purifying the native sulphate.**Characters.**—Small, colourless, transparent, rhombic prisms. Taste bitter. **Solubility.**—1 in 1 of cold water.**Identification.**—Epsom salts resemble zinc sulphate, but they are distinguished by the absence of metallic taste, the crystals being more or less coherent, and by the absence of opaque or powdery appearance when exposed to air.**Incompatibles.**—Potassium and sodium carbonates and bicarbonates, lime water, lead acetate, and tartarated soda which precipitates magnesium tartrate.**Action.**—Hydragogue purgative.**B.P. Dose.**—30 to 120 grs. for repeated administration; $\frac{1}{2}$ to $\frac{1}{2}$ oz. for a single dose.

OFFICIAL PREPARATION

1. **Magnesii Sulphas Effervescens.** *Syn. B.P.—Effervescent Epsom Salts.*
—Antacid and cathartic. **B.P. Dose.**—60 to 240 grs. for repeated use ;
 $\frac{1}{2}$ to 1 oz. for a single dose.

NON-OFFICIAL PREPARATION

1. **Magnesii Salicylas.**—Colourless hygroscopic needles, soluble in water.
Given with advantage in *typhoid fever* in 50 to 100 grs. daily.

PHARMACOLOGY

Externally.—None.

Internally. **Gastro-intestinal canal.**—Both the oxide and the carbonates are **alkaline**, and neutralize the normal or the excessive acidity of the stomach, and are converted into chloride or lactate, both of which are soluble. What is unaffected is left insoluble. The carbonate sets free carbonic acid, which exerts a local sedative influence. Therefore they are **antacid**. On account of the low diffusion power, the chloride and lactate, though soluble, are not freely absorbed ; consequently almost all the magnesia is transmitted to the intestines, where the chloride is decomposed by the alkaline bile, and the oxide re-precipitated, which is converted first into carbonate and then into bicarbonate by the carbonic acid gas of the bowels. Thus the oxide, the carbonate or the sulphate if directly given will act as **purgatives** only after conversion into bicarbonates.

Prof. Hay's experiments have proved that magnesium sulphate produces intestinal secretion in proportion to the dosage and strength of the solution administered, no doubt the low diffusion power of the salt preventing the absorption of the secreted fluid ; hence, with the retarded absorption and stimulated secretion, the fluid accumulates in the intestines till the quantity amounts to what would be necessary to make about 5 or 6 per cent. of the solution of salt. The weaker the solution the less the secretion, and if the salt in the solution is less than 5 per cent. there is no secretion into the bowels. Again, if the solution is concentrated and given during fasting, profuse serous discharge within the bowels is the result. Thus, by 1 or 2 ozs. of salts dissolved in its own weight of water, such a hydragogue purgation can be induced, as will be equal to a depletion by blood-letting.

Most of the magnesium salts are passed out unaltered in the stools. Magnesium sulphate does not stimulate the liver.

According to some, magnesium sulphate (2 grs.) given hypodermically purges ; the purgative action is probably due to the paralysis of the inhibitory fibres of the splanchnics.

Blood.—Magnesium salts enter the blood as a chloride or lactate and render the **plasma more alkaline**.

Urine.—What little salt is absorbed is passed out by the kidneys, increasing the flow of urine, rendering it **alkaline**, and to a

certain extent **dissolving uric acid** ; but the diuretic effect is weaker than that of the potassium and sodium salts.

THERAPEUTICS

Externally.—A saturated solution of magnesium sulphate used as a compress relieves pain and acts as a local anæsthetic. It is also an excellent remedy for **erysipelas** and other **inflammatory affections**.

Internally.—The oxide and the carbonate are largely employed in **acid dyspepsia, heartburn, pyrosis, vomiting, sick headache**, or any other complaint attended with acidity. Their antacid property is considerably increased by combining them with sodium bicarbonate and sal volatile. As a tasteless, unirritating alkaline laxative, they are often used in combination with rhubarb, as Pulv. rhei co. and Goodeve's "Red Mixture" in **constipation of children**. Liq. magnesii carb. is an agreeable and alkaline laxative in acid dyspepsia accompanied by constipation.

As chemical **antidotes**, they are successfully used in **poisoning** by **mineral acids, oxalic acid**, and the salts of **mercury, arsenic and copper**, as they form insoluble compounds with them. In **alkaloidal poisoning** they hinder the absorption of alkaloids by making the contents of the stomach alkaline. But in order to get these antidotal effects, they must be given in very large doses, which is the only objection. Magnesium sulphate acts as an **antidote to lead and barium** salts by precipitating their insoluble sulphates.

As a **diuretic** and feeble alkalinizer of blood and urine, they are used in **gout and gravel** cases, where the salts of potassium and sodium are not well borne. Many mineral waters containing magnesium are valuable diuretics, such as Harrogate, Carlsbad, Ems, Baden-Baden, &c.

Magnesium sulphate (Epsom salt) is almost daily used as a **purgative**. Its action is less rapid than that of sodium sulphate (Glauber's salt) but is free from nausea and griping. It can be given in the form of Mist. Sennæ Co. or in solution with aromatics. In **biliousness or portal congestion**, it is best given to complete the action of cholagogue pills. It makes an excellent aperient for those who are gouty, and suffer from uric acid gravel. It has been successfully used in bacillary dysentery and in mild cases of amœbic dysentery ; it has no specific effect however on the amœbæ, and in all cases of any severity should give way to the ipecacuanha treatment. Large quantities of **serum** can be drained off through the bowels by giving concentrated solutions during fasting, so that **dropsy, anasarca, ascites, pleurisy, &c.**, can be greatly reduced. Many popular mineral waters, such as Hunyadi Janos, Friedrichshall and Pulna owe their purgative action to the magnesium sulphate they contain. The dose of magnesium sulphate can be reduced by mixing it with acid. sulph. dil., which

increases the intestinal peristalsis. It is an excellent laxative to counteract the constipating effect of iron in cases of **anæmia**.

Caution.—If large doses of magnesia or magnesium carbonate are given for any length of time, concretions of ammonio-magnesium phosphate are apt to form in the bowels, leading to intestinal obstruction, peritonitis, perforation, and death. Care must therefore be taken to watch the patients who are taking this medicine regularly. If a moderate degree of concretion is diagnosed, full doses of vinegar deserve a trial.

Prescribing hints.—Epsom salts are generally given in mixtures. The nauseous taste can very well be covered by liquorice or chloroform. To prevent their griping properties aromatics or carminatives should be combined with them. The carbonates and the light and heavy magnesia are generally administered in **pills, cachets or lozenges**. When in solution they are best given in the form of *Mist. Alba*. The heavy magnesia sometimes becomes aggregated into a solid mass when ordered in a mixture.

MALTUM. Malt. U.S.

(*Non-official*)

N.O. *Graminaceæ*

Syn.—Byne.

Source.—The seeds of common barley, *Hordeum distichum*, caused to enter into an incipient stage of germination and then dried.

Characters.—A brownish powder.

Composition.—It contains the ferment *diastase*, which can convert starch into dextrin and maltose.

Action.—Assists carbohydrate digestion. *Dose.*—1 to 2 drs.

NON-OFFICIAL PREPARATIONS

1. **Extractum Malti, B.P.C.** *Syn.*—*Maltine*.—A syrupy yellowish-brown liquid, made by mixing malt with tepid water and evaporating below 131° F. Consists chiefly of dextrin and maltose. Can be obtained in a large number of combinations, *v.c.* with cod-liver oil, hypophosphites, iron, quinine, &c. Valuable as a restorative, especially in cases where the digestion is weak. *Dose.*—1 to 4 drs.

2. **Extractum Malti Liquidum.** *Syn.*—*Bynin*.—Similar to the above, but concentrated *in vacuo* to prevent decomposition of the diastase, and then 7 p.c. of alcohol added. *Dose.*—1 to 4 drs.

3. **Bynin Amara.**—A combination of Bynin with the phosphates of iron, quinine, and strychnine. It is one quarter the strength of Easton's Syrup. *Dose.*—2 to 4 drs.

4. **Bynol.**—A combination of Bynin and Ol. Morrhuæ.

5. **Extractum Malti Ferratum.**—Maltine containing 2 p.c. of Iron Pyrophosphate. *Dose.*—1 to 4 drs.

6. **Ext. Malti c. Oleo Morrhuæ, B.P.C.**—Should contain at least 15 p.c. of oil. Salicylic acid is often added as a preservative. *Dose.*—1 to 4 drs.

PHARMACOLOGY AND THERAPEUTICS

Powdered malt in combination with baked wheaten flour in varying proportions forms most of the popular infants' food. It may also be taken mixed with milk or beer or sprinkled over porridge, but as diastase only acts in an alkaline medium it is best to give malt two hours after a meal. It then acts powerfully in promoting carbohydrate digestion.

The various malt extracts are chiefly valuable as foods for persons suffering from *wasting diseases* such as **phthisis**, as they are easily tolerated by the stomach, and maltose leads to the formation of fat.

MEL DEPURATUM. Clarified Honey

Source.—Commercial honey melted in a water-bath, and strained, while hot, through flannel previously moistened with warm water.

Characters.—A viscid, translucent, yellowish liquid, becoming crystalline and opaque. Odour honey-like. Taste sweet. **Impurities.**—Starch, syrup, &c.

Composition.—A mixture of several kinds of sugar, viz. cane-sugar, grape-sugar, levulose; also wax, pollen, colouring and odorous matters, &c.

Enters into.—Confectio Piperis and the

OFFICIAL PREPARATIONS

1. **Mel Boracis.**—1 in 7 by volume.
2. **Oxymel.**—4 in 5. Expectorant. Used as vehicle. **B.P. Dose.**—1 to 2 drs.
3. **Oxymel Scillæ.**—Expectorant. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.

PHARMACOLOGY AND THERAPEUTICS

Externally.—Honey is a demulcent and is used as a covering to **boils** and **excoriations**. It is also used as a cosmetic.

Internally.—It is said to increase the secretions of the mouth and throat, and thus acts as a **demulcent**, relieving dryness of the mouth, cough, and difficulty in swallowing. Hence it is used in gargles, cough mixtures and linctuses. It is a **nutrient** and in large doses **laxative**, and is therefore used to open the bowels of infants. Honey makes an excellent vehicle for castor oil and for administration to new-born babes and infants.

MENTHÆ PIPERITÆ OLEUM

Oil of Peppermint. N.O. *Labiatae*

Habitat.—Britain, United States, Japan, &c.

Source.—The oil distilled from fresh flowering peppermint, *Mentha piperita*.

Characters.—Colourless, pale-yellow or greenish-yellow when fresh, becoming darker by age. Odour of the herb. Taste aromatic, followed by a sensation of coldness. Sp. gr. 0.900 to 0.920. **Solubility.**—1 in 4

of alcohol (90 p.c.). *Impurity*.—Dementholized oil of peppermint known as "Menthene."

Composition.—Contains several hydrocarbons ($C_{10}H_{16}$), *menthone* ($C_{10}H_{18}O$) and other bodies, and deposits crystalline peppermint camphor known as *menthol* when exposed to low temperatures. *Japanese oil* contains the largest percentage of menthol, and *American* less. There are all manner of gradations of the English oil.

Action.—Stimulant, antispasmodic, carminative.

B.P. Dose.— $\frac{1}{2}$ to 3 ms. on sugar or pill.

Enters into.—Pil. Rhei Co., Tr. Chlorof. et Morph. Co., and the

OFFICIAL PREPARATIONS

1. **Aqua Menthæ Piperitæ**.—1 in 1000. *Dose*.—1 to 2 ozs., 1 dr. for a child 1 year old.
2. **Spiritus Menthæ Piperitæ**.—1 in 10. **B.P. Dose**.—5 to 20 ms. This is half the strength of that of B.P. 1885.

NON-OFFICIAL PREPARATIONS

1. **Peppermint Syrup**.—Spt. Menth. pip. 1 dr., in simple syrup 1 oz.
2. **Peppermint Lozenge**.

PHARMACOLOGY AND THERAPEUTICS

Externally.—The action of the oil of peppermint resembles that of the volatile oils generally, but the sensation of coldness and numbness after a feeling of warmth is more marked. This is due to the contraction of the local blood-vessels after a brief stimulation and to the sedative action on the nerves. Hence, it is a local **anæsthetic** and is therefore used to allay the pain of **superficial neuralgias** and **herpes zoster**. It is also a powerful **antiseptic** and employed in **diphtheria**. It relieves the **toothache** due to a carious tooth. The smell of the oil is said to keep off mosquitoes.

Internally.—It has a similar action on the gastric mucous membrane and thus allays **nausea** and **discomfort**. For its powerful antispasmodic and carminative properties, it is often used to relieve **flatulent colic** and **spasmodic pains** of the stomach. It corrects the griping effect of purgatives and covers the nauseous taste of drugs. It is said to reduce the number of white corpuscles in the blood by diminishing the activity of the intestinal absorbents.

MENTHÆ VIRIDIS OLEUM

Oil of Spearmint. N.O. *Labiata*

Syn. I. V..—*Pudinar tel*, Beng. *Páhári pudiná ka tel*, Hind.

Habitat.—Britain, Germany, &c.

Source and Characters.—The oil distilled from fresh flowering spearmint, *Mentha viridis*. Colourless, pale yellow or greenish-yellow when fresh, becoming darker by age. Odour and taste of the herb. Sp. gr. 0.926 to 0.940. **Solubility**.—1 in $\frac{1}{2}$ of absolute alcohol and alcohol (90 p.c.).

- Composition.**—(1) *Carvone* or *carvol*, a stearoptene found in oil of caraway.
 (2) *Unoxygenated terpenes*.
Action and dose.—The same as of peppermint.

OFFICIAL PREPARATION

1. **Aqua Menthae Viridis.**—1 in 1000. *Dose.*—1 to 2 ozs.; 1 dr. for a child 1 year old.

PHARMACOLOGY AND THERAPEUTICS

These are similar to those of the oil of peppermint.

MENTHOL. Menthol



Syn.—Sometimes called Peppermint Camphor.

Habitat.—China, Japan, United States.

Source.—Obtained by cooling the oil distilled from fresh herb of *Mentha arvensis*, vars. *piperascens* et *glabrata* and of *Mentha piperita*.

Characters.—Colourless acicular crystals, or crystalline masses. Odour and flavour of peppermint, producing a sensation of warmth on the tongue, and if inhaled a sensation of coldness. Melting-point 107.6° F. *Solubility.*—Very slightly in water, 5 in 1 of alcohol, and 1 in 4 of olive oil.

Action.—Antiseptic, antineuralgic, local anæsthetic.

B.P. Dose.— $\frac{1}{2}$ to 2 grs. in pill. Externally as cone or pencil.

OFFICIAL PREPARATION

1. **Emplastrum Menthol** (altered).—3 in 20. Local anodyne.

NON-OFFICIAL PREPARATIONS

1. **Mentholeate.**—Menthol 200 grs., Oleic Acid $\frac{1}{2}$ oz., dissolve by gentle heat in a test-tube. In *pruritus*.

2. **Linimentum Menthol, B.P.C.**—Menthol 3, Chloroform 4, Olive Oil *q.s.* to 16. In *neuralgia*, *sciatica*, *lumbago*, and *ringworm*.

3. **Pigmentum Menthol, G.H.**—1 to 4 of olive oil. Painted into the larynx or trachea in *laryngeal disease* or *phthisis*.

4. **Tr. Menthol Etheræa.**—Menthol 1, Purified Ether 8. Applied with a glass brush.

5. **Menthol Spray.**—Menthol 1, Chloroform 10, Ether 16. Local anæsthetic.

6. **Pimenthol** is obtained from American oil melting at 104° F.

7. **Po-ho-yo.**—A Chinese oil of peppermint sold as Japanese drops.

8. **Validol.**—A speciality containing 30 p.c. of menthol in valerianic acid. A colourless liquid with an agreeable smell and no burning taste. Used in *hysteria* and *neurasthenia*. *Dose.*—10 to 15 ms., either in wine or on a lump of sugar.

9. **Insufflatio Menthol et Cocaine, B.P.C.**—Menthol 2.5, CocaineHydroch. 0.15, Ammonium chloride 25, Camphor 5, Lycopodium to 100.

10. **Gossypium Menthol, B.P.C.**—10 p.c. useful as a plug in *nasal catarrh*.

PHARMACOLOGY AND THERAPEUTICS

Externally.—Menthol locally applied causes first stimulation, soon followed by a feeling of coldness, numbness, and **anæsthesia** of the part, and thereby relieving the pain of **neuralgias**, and other superficial pains. This is very well done by either drawing over the skin solid menthol, or by painting it with linimentum menthol, or a liquefied preparation, such as, menthol cum camphor, menthol cum chloral, or by plaster. Any painting near the eyes causes a free flow of tears from the vapour. During hot months, the B.P. plaster liquefies and oozes through calico, or escapes by the edges of the prepared plaster, and therefore it requires hardening. The plaster or liniment is often found useful in **rheumatic** and **pleurodynic pains**, **lumbago** and **sciatica**. Mentholcate, alcoholic solution (1 in 8), or menthol ointment (5 to 20 grs. in 1 oz. of vaseline or simple ointment), remarkably relieves **pruritus**. The ointment has been found specially useful in **pruritus pudendi et ani**.

Menthol when rubbed up with either thymol, phenol, chloral hydrate, camphor or butyl chloral, forms an oily liquid, which is an excellent remedy for **toothache**. It should be put into the cavity of the carious tooth and covered with a pledget of absorbent cotton.

Menthol is also a powerful **antiseptic** and **antiparasitic**. Its alcoholic solution or liniment has given good results in **ringworm** of the scalp. The painting of an alcoholic or ethereal solution (10 to 50 p.c.) at times relieves the **inflammation of boils** and **carbuncles**. As a **snuff** (menthol 5 grs. in 1 oz. of starch, talc or oxychloride of bismuth, or along with boric acid 2, and ammon. chloride 3 parts) it has been found effective in **influenza**, **hay fever**, **catarrh** and **ozæna**.

Internally.—The alcoholic solution has been painted in **diphtheria**. The pigment (20 to 30 ms.) has been injected into the larynx for **laryngeal** and **tracheal tubercle** and **bronchiectasis** with good effects. The anæsthetic effect lasts about 24 hours after a few injections. Menthol 1 gr. in olive oil 1 oz. has been usefully injected for thread-worms. It is rarely employed internally, except occasionally as a corrigens of gripping purgative pills.

MEZEREI CORTEX

Mezereon Bark. N.O. *Thymelacæe*

Habitat.—Mountainous countries of Europe, the Punjab, and the Himalayas.

Source.—The dried bark of *Daphne mezereum*, *Daphne laureola*, or of *Daphne gnidium*.

Characters.—Long, thin, flattened strips or quills, tough and fibrous. Externally brown, internally whitish and silky. Inodorous. Taste acrid, burning.

Composition.—(1) *Resin*, acid. (2) *Mezereinic acid*. (3) *Fixed oil*, inert. (4) *Daphnin*, a glucoside.

Action.—Rubefacient, vesicant, stimulant, diaphoretic, and diuretic.

Enters into.—Liq. Sarsæ Co. Conc. (q.v.).

NON-OFFICIAL PREPARATION

1. **Ext. Mezerei Æthereum, B.P. 1885.**—Used in making Lin. Sinapis Co. B.P. 1885.

PHARMACOLOGY AND THERAPEUTICS

Mezereon bark is a powerful **local irritant**, like mustard, producing first **rubefaction** then **vesication**. Lin. Sinapis Co. of B.P. 1885, which contains the ethereal extract, is yet used in acute **bronchitis** and **pneumonia**. Internally, it acts in small doses as a stimulant, diaphoretic and diuretic, and is used in rheumatism and syphilis in the form of Liq. Sarsæ Co. Conc. It has never been used alone, and its efficacy is open to doubt. In large doses it is an irritant poison.

MORPHINA. See Opium

MORRHUÆ OLEUM

Cod-liver Oil. N.O. *Teleostei*

Syn. I. V.—*Mächer tel*, Beng. *Machli ka tel*, Hind.

Habitat.—Coasts of Norway, Newfoundland, France, England, Labrador.

Source.—The oil extracted from the fresh liver of the cod, *Gadus morrhua*, by the application of a temperature not exceeding 180° F.; and from which solid fat has been separated by filtration at about 23° F.

Characters.—Pale yellow, with a slight fishy but not rancid odour. Sp. gr. 0.920 to 0.930. **Solubility.**—Readily in ether and chloroform, and slightly in alcohol (90 p.c.).

Composition.—(1) *Olein* 85 p.c. (2) *Acetin* (C₉H₁₄O₆). (3) *Palmitin* (4) *Stearin*. (5) *Free fatty acids* (oleic, palmitic, stearic). (6) *Trimethylamine*. (7) *Traces of iodine, bromine, sodium, calcium, potassium, iron, phosphoric and sulphuric acids*, &c. (8) *Several alkaloids*, such as *morrhuline*, *aselline*, *butylamine*, *amylamine*, and *hexylamines*, &c. (9) *Biliary constituents*, such as *cholesterin*. (10) *Resinous matter*. (11) *Colouring matter*.

Rancidity is due to the formation of *hydroxy-acids*, and not the breaking up of *glycerides*.

B.P. Dose.—1 to 4 drs.

NON-OFFICIAL PREPARATIONS

1. **Cod-liver Oil Capsules.**—½ to 1 dr. in each. **Dose.**—1, 2, or more.

2. **Emulsio Olei Morrhue Composita, B.P.C.**—1 in 2. Cod-liver oil 8 ozs., Yolks of Eggs 6.5 p.c. (by volume), Pulv. Tragacanth 16 grs., Elix. Glusidi 1 dr., Tr. Benzoin. (simple) 1 dr., Spt. Chloroform. 4 drs.,

Essential Oil of Bitter Almonds 8 ms., Distilled Water *q.s.* to 16 oza. Triturate tragacanth with a little oil, add yolks and stir, gradually adding water and oil alternately; transfer to a pint bottle, add the remainder previously mixed, shake well, and make up to 16 oza. *Dose*.—2 to 8 drs.

3. **Emulsio Olei Morrhu. et Hypophosphitum**.—(Contains calcium and sodium hypophosphites 1 p.c. each. *Dose*.—2 to 8 drs.

4. **Morrhual.** *Syn.*—*Ext. Olei Morrhuæ Alcohol.*—A bitter, aromatic, yellowish-brown liquid, prepared by the evaporation of the alcoholic solution of cod-liver oil, containing the active principles with organic fatty matter. A good substitute for the oil in cases when it is not tolerated. Each capsule of 3 ms. represents 80 ms. of cod-liver oil. *Dose*.—1 or more.

5. **Pangaduine**.—In solid crystals, reputed to contain all the active principles of cod-liver oil. 1 gr. represents 1 oz. of oil.

6. **Lofotol**.—An effervescent preparation of cod-liver oil charged with carbon dioxide. Said to be less prone to rancidity than the ordinary oil. Very palatable and easily digested.

7. **Dermosapol**.—A superfatted soap containing 50 p.c. of cod-liver oil in combination with Peruvian balsam, glycerin, lanolin, and an alkali. May be medicated in various ways.

PHARMACOLOGY

Externally.—Cod-liver oil is a bland unirritating oil, freely absorbed through the skin.

Internally. **Gastro-intestinal tract.**—On account of its fishy, unpleasant smell, many patients cannot retain it, and with some it creates indigestion. In large doses, it may cause diarrhœa, the oil being expelled in the stools. Experimentally, it has been proved that cod-liver oil is more rapidly absorbed than other oils, fats, butter, ghee, &c. It is also better digested, because the free acids it contains no doubt facilitate its emulsification and saponification by its admixture with the alkaline secretions of the pancreas, the intestinal glands and bile. Along with the cod-liver oil, other oils and nitrogenous elements of the food are helped in their digestions, and are also better absorbed by the lacteals. Thus, it acts as a general **digestive agent**. Bile no doubt plays an important part in the absorption of all fats and oils, for it has been found from experiments that fats pass with difficulty through moist animal membranes, but readily through them if moistened with bile. The biliary constituents contained in the oil itself also aid its absorption but many authorities deny their presence, saying that they are insoluble in oil.

Blood.—Cod-liver oil is said to enrich the quality of the blood especially that of the corpuscles, which are augmented. This is due to the absorption of the fatty principles and other constituents of the oil. Therefore it is a **hæmatinic**.

Tissues and metabolism.—Cod-liver oil is not only quickly absorbed but readily assimilated, imparting more nutrition to the cells than

can ordinarily be done by other oils and fats. It is therefore reckoned more as a **food** than a medicine. Iodine, bromine, phosphorus, &c., perform their share when administration is continued for a long period, but it must be understood that the specific action of cod-liver oil depends more upon its fatty constituents than on the extraneous constituents it contains. It also oxidizes readily in the tissues, checks the wastage of other nitrogenous elements, and promotes healthy cell formation; this is the explanation of the increase of **body-weight** during a course of cod-liver oil treatment. In fact the superiority of cod-liver oil over other oily and fatty substances depends chiefly upon (1) rapid absorption, (2) quick assimilation, (3) ready oxidation, (4) higher nutritive value, and (5) its powerful effect on cell-growth and metabolism. Therefore many morbid conditions of the system due to faulty assimilation and defective oxidation are slowly removed by it; hence it is an excellent **alterative tonic**.

Elimination.—It is mostly absorbed, a little is expelled in the **fæces**. Some of the acid ingredients escaping through the skin may produce a sort of **acne**.

THERAPEUTICS

Externally.—If the oil is not retained, or creates indigestion or diarrhoea, inunction of oil is a capital method for introducing it into the system. 2 to 4 drs. rubbed into the skin after a hot bath, or a particular part after washing it with soap and hot water, give at times very striking results. Wasting diseases of children are specially benefited by this method, the only drawback being its objectionable odour.

Internally.—It is of signal service in all sorts of chronic wasting diseases dependent on malnutrition and malassimilation, especially so in **scrofulous disease** in its various forms, and **phthisis, rickets, caries of bones, chronic joint disease**, e.g. rheumatic or scrofulous arthritis, **long-continued suppuration, chronic eczema, lupus, psoriasis, tertiary syphilis, chronic bronchitis, whooping-cough, emphysema, asthma, general debility** due to under-feeding, exhaustion, overwork, &c., **convalescence** from acute illness, e.g. pneumonia, &c., are benefited under its course. Some authorities even go so far as to assert that it cures some forms of phthisis. As a nourisher and restorer of nerve-cells, it has been found to be of great value in many **nervous disorders** due to old age, debility or exhaustion, such as mental irritability, despondency, neurasthenia, hysteria, chorea, neuralgia, headache, &c. Sometimes constipation yields to it. Many of the above diseases are remarkably benefited by the combination with iron and iodine or quinine and hypophosphites.

Contra-indications.—Indigestion, nausea, vomiting, eructation, diarrhoea, gastric catarrh, high temperature, severe hæmoptysis, primary or induced, contra-indicate its use.

Dose and mode of administration.—It should always be begun in small doses, say 1 dr., unless it is desired that the surplus quantity should act as a mild laxative. It should be gradually increased to 4 drs., and always given after food, twice or thrice daily. In rare instances, the maximum dose requires to be increased. In the beginning, say for one week, it is a good plan to give only one dose a day, preferably after dinner.

Brown oil is superior to pale oil because it contains more fatty acids, but its disagreeable smell and taste are a drawback. Children generally can take it better, or soon get accustomed to its taste, but in the majority of cases a pleasant combination becomes necessary. Saponification should be avoided on account of the chemical changes that would occur with the fatty acids contained in the form of glycerides, in fact the great point is to preserve these acids absolutely unchanged. Hence, emulsification, as in Emulsio Olei Morrhue Composita, B.P.C., is only to be recommended. It can be extemporaneously emulsified by gum acacia or tragacanth, sweetened by glycerin and flavoured by lemon or bitter almond oils. It can also be given in flexible capsules, mixed with isinglass, jelly, or still better with extract of malt. Some patients prefer to take it on milk, coffee, wine, or orange juice. A pinch of salt placed on the tongue, a cut lemon sucked, a piece of fresh ginger well chewed, and some of the juice swallowed before and after the dose, effectively remove the nauseous taste in many instances. To help its emulsification as well as to stimulate the pancreatic secretion, purified ether (10 to 20 ins.) is sometimes combined with it.

If the oil disagrees, morrhual or wine of cod-liver oil, which is but a solution of morrhual, may be given instead. When no method can be found by which the oil can be retained and digested, inunction is the last resource (see p. 451). It is sometimes injected subcutaneously or any of the following substitutes (*q.v.*) may be tried: Maltolive, Marrubin, Oleum Olivæ c. Acido Oleico, Mistura Olei Olivæ, Virol.

MOSCHUS. Musk.

N.O. Ruminantia

Syn. I. V.—*Mriganāvi*, *Kasturi*, Beng., Sans. *Kasturi*, Hind.

Habitat.—Central Asia, Thibet, exported to Europe from Benga and China.

Source.—The dried secretion from the preputial follicles of *Moschus moschiferus*.

Characters.—In irregular, reddish-brown or reddish-black somewhat unctuous grains. Odour characteristic, persistent, taste somewhat bitter. Contained in an oval sac, 1½ to 2 in. in diameter, nearly smooth on one side, covered on the other or outer side by brownish-yellow or greyish appressed bristle-like hairs concentrically arranged around a central orifice.

Impurities.—Dried blood, catechu, earthy matter, cinnabar, pieces of leather, &c. The sac is so ingeniously filled and stitched that the contents cannot be made out unless it is cut open.

Tests.—Should be free from earthy matters, and on incineration should not yield more than 8 p.c. of ash. There is considerable moisture amounting to about 36 p.c. The spurious sac has no aperture and the hairs are not so well arranged circularly, and there is no trace of penis which is found in every genuine pod.

Composition.—(1) An *aromatic principle* with unknown composition.
 (2) *Inactive substances*, such as fixed oils, fats, salts, &c. Complete drying removes the odour, but it returns when moistened with water.

Action.—Stimulant and antispasmodic.

B.P. Dose.—5 to 10 grs. in pill or emulsion.

NON-OFFICIAL PREPARATIONS

1. **Mistura Moschi.**—Musk 9 grs., Acacia 9 grs., Sugar 9 grs., Rose Water 10 ozs. *Dose.*— $\frac{1}{2}$ to 2 ozs. or more.

2. **Tr. Moschi.**—Musk 6 grs., Alcohol (90 p.c.) 1 oz. Digest for 7 days, and strain. *Dose.*— $\frac{1}{2}$ to 1 dr.

PHARMACOLOGY AND THERAPEUTICS

Internally.—Musk is known to be a powerful **diffusible stimulant** to the **cardiac, respiratory** and **nervous** systems. Whether this action is a **reflex** stimulation from the nose, mouth and stomach, or is due to **direct** influence on the cardiac and respiratory centres, and the cells of the brain, is not known; perhaps to both. In moderate doses, it may cause giddiness, heaviness of the head, headache, dryness of the gullet, eructations, sometimes nausea, followed by sleepiness or faintness. In large doses it may produce tremor and convulsions. It is an **antispasmodic**. It is excreted in the urine and sweat, and the unabsorbed portion passes out with the stools, which are imbued with its odour.

Musk is chiefly used to sustain and strengthen a failing heart and pulse in **adynamic, febrile** and **other diseases**, such as low **remittent, typhus** and **typhoid fevers, pneumonia**, &c. It is a mistake to use it as a last resource, when the vital powers are fast fading away. To be of use, the dose is to be repeated frequently, as it is soon excreted. Trousseau extols it in **drunkard's pneumonia**, and Wood recommends it in **delirium tremens**. Ten drops of the tincture every $\frac{1}{4}$ hour for 4 to 6 doses, remove **cardiac dyspnoea**, and induce sleep. It was employed in melancholia, hysteria, chorea, whooping-cough and epilepsy, but is scarcely used now. The tincture has been found by the writer to check some forms of hiccough, and in combination with strophanthus, to remove palpitation of hysterical subjects.

It is best given in a **mixture**, as the **mistura moschi**, **pill** or **linctus** made with camphor and honey.

It is the only stimulant used by the native *Kavirajes* who practise the ancient Hindu system of medicine.

MYLABRIS. Mylabris

N.O. Coleoptera (*Ind. and Col. Addendum*)

Syn.—The Telini Fly. **Syn. I. V.**—*Telini-poká*, Beng. *Telini-makhi*. Hind.

Habitat.—India, Eastern and African Colonies.

Source.—The dried beetle of *Mylabris phalerata*.

Characters.—About 1 in. long, $\frac{3}{4}$ in. wide. The elytra long, black, with two broad zig-zag, orange-coloured transverse bands, and a large orange-coloured spot at the base. A pair of brown membranous wings.

Composition.—*Cantharidin*, active principle.

OFFICIAL PREPARATIONS

1. **Acetum Mylabridis.**—1 in 5 of Glacial Acetic Acid and 5 of Water.
2. **Emplastrum Calefaciens Mylabridis.**—See p. 22. Substitute Mylabris for Cantharis.
3. **Emplastrum Mylabridis.**—See p. 22. Substitute Mylabris for Cantharis.
4. **Liquor Epispasticus Mylabridis.**—1 in 2 of Acetic Ether. See p. 33. Substitute Mylabris for Cantharis.
5. **Unguentum Mylabridis.**—1 in 10 of Benzoated Lard. See p. 58. Substitute Mylabris for Cantharis.

PHARMACOLOGY AND THERAPEUTICS

The action and uses of mylabris are precisely the same as those given for cantharis (see p. 314).

MYROBALANUM

Myrobalan

N.O. *Combretaceæ* (*Ind. and Col. Addendum*)

Syn.—Chebulic Myrobalans. **Syn. I. V.**—*Haritaki*, Beng. *Hara*, Hind. *Haritaki*, *Abhaya*, Sans.

Habitat.—India and Eastern Colonies.

Source.—The dried immature fruits of *Terminalia chebula*.

Characters.—About $\frac{1}{2}$ to $\frac{3}{4}$ in. long, $\frac{1}{4}$ in. wide, ovoid or fusiform like an olive, but shrivelled longitudinally; black, solid, and brittle, with shining fracture. Taste very astringent.

Composition.—(1) *Gallo tannic acid*, about 25 p.c. (2) *Gallic acid*. (3) Resin, &c.

There are two varieties of *Terminalia chebula* met with in the bazaars; one known as *jangi haritaki*, the unripe but dried fruits of the above-named plant. The other variety is *haritaki* so common in the bazaars, the dried mature fruit of the plant.

Action.—Astringent, alterative, and tonic.

B.P. Dose.— $\frac{1}{2}$ to 1 dr.

OFFICIAL PREPARATIONS

1. **Unguentum Myrobalani.**—1 in 4 of Benzoated Lard.
2. **Unguentum Myrobalani cum Opio.**—Myrobalan Ointment 925, Opium in powder 75.

PHARMACOLOGY AND THERAPEUTICS

These fruits were highly extolled by the ancient Hindu physicians as powerful astringents, stomachics, tonics and alteratives. In olden

times they held a prominent place amongst the masticatories, and even now many habitually use them with no troubles to the organs of mastication. The powdered fruits form an important ingredient of tooth powder, which when regularly used prevents the teeth from premature fall and decay. It is also a valuable remedy for **spongy** and **ulcerated gums**, and acts as a gentle **purgative**. One or two fruits taken daily at bedtime keep the bowels very regular, giving one or two evacuations in the morning. On account of the astringent and aperient properties, myrobalans, especially the smaller variety (*Jangi haritaki*), are very useful in **diarrhoea** and **dysentery**. Owing to the large amount of tannin which they contain, they are of great service as **lotions** and **injections** and may be substituted with advantage for **galls**. They can also be chewed with benefit to remove the after-taste of nauseous drugs. *Jangi haritaki* fried in a little good *ghee*, and then soaked in the sun for about a week with lime juice and black salt, is a well-known domestic remedy.

MYRISTICA. Nutmeg

N.O. *Myristicaceæ*

Syn. I. V.—*Jaiphal*, Beng. *Javphal*, *Jati*, *Jaintri*, Hind.

Habitat.—Banda Islands of the Malayan Archipelago; Malabar and Ceylon.

Source.—The dried seed of *Myristica fragrans*, divested of its testa.

Characters.—Ovoid, about 1 in. long. Externally greyish-brown, with reticulated furrows. Internally greyish-red marbled with brownish-red veins. Odour strong, aromatic. Taste aromatic, warm, bitter.

Composition.—(1) Fixed or Concrete Oil, 30 p.c. (2) *Volatile Oil*, 4 p.c. (3) Starch, &c.

Action.—Stimulant, carminative, narcotic. *Dose.*—5 to 20 grs.

Enters into.—Pulv. Catechu Co., Pulv. Cretæ Aromat., Spt. Armoracia Co., Tr. Lavand. Co.

OLEUM MYRISTICÆ

Oil of Nutmeg

Source and Characters.—A pale yellow oil, distilled from the nutmeg. having the odour and taste of nutmeg. *Solubility.*—1 in 4½ of alcohol (90 p.c.), sp. gr. 0.87 to 0.91.

Composition.—(1) *Myristicin*, a terpene. (2) *Myristicol*.

B.P. Dose.—½ to 3 ms. on sugar or in pill.

Enters into.—Pil. Aloes Soc., Spt. Ammon. Aromat., Tr. Guaiaci Ammon., Tr. Valerian. Ammon., and the

OFFICIAL PREPARATION

1. **Spiritus Myristicæ** (altered)—1 in 10. **B.P. Dose.**—5 to 20 ms.
Enters into.—Mist. Ferri Co.

NON-OFFICIAL PREPARATION

1. **Oleum Myristicæ Expressum.** *Syn.*—*Adeps Myristicæ.*—A concrete oil obtained by expression and heat. Diluted with a bland oil or soap liniment, it is a useful application to *sprains, rheumatism, paralysis, &c.*

PHARMACOLOGY AND THERAPEUTICS

Externally.—The volatile and the fixed oils are used for perfuming pomades and lotions for the hair, and diluted with olive oil or soap-liniment as an embrocation in **chronic rheumatism**. The expressed oil is said to possess antiseptic and antiparasitic properties. Nutmeg made into a paste is sometimes used by the people of India to remove headache and neuralgia.

Internally.—For its agreeable aroma it is used in cooking. Both the kernel and the volatile oil are **gastric stimulants**, increasing the flow of gastric juice, and **carminatives**, expelling intestinal flatus; hence they can be used in **dyspepsia, cramps** and **flatulence**. The volatile oil relieves toothache, and the kernel is chewed to remove fetor of breath. An infusion of nutmeg is said to allay the thirst of cholera patients. In large doses it acts as a **powerful narcotic**, causing giddiness, vertigo and coma, symptoms resembling those that follow poisonous doses of camphor.

MYRRHA. Myrrh

N.O. *Burseraceæ*

Syn. I. V.—*Gandharasha, gundhabul, Bol, Beng. Bola, Sans. Bol, Hind.*

Habitat.—Somaliland, Arabia Felix, and Western India.

Source.—A gum-resin obtained from the stem of *Balsamodendron myrrha*, and probably other species.

Characters.—In rounded or irregular tears or masses of agglutinated tears varying in size, reddish-brown or reddish-yellow, dry, brittle, covered with a fine powder; fractured surface irregular, somewhat translucent, brown, oily, with whitish marks. Odour agreeable, aromatic. Taste aromatic, bitter, acrid. Partly soluble in water, resin soluble in alcohol. *Impurities.*—Resins and gum-resins, false myrrh. Bombay is the chief myrrh market. The best quality is the *Karam myrrh*.

Composition.—(1) *Gum*, 60 p.c. (2) *Myrrhin*, a resin 23 p.c. (3) *Myrrhol*, a volatile oil. (4) A bitter principle.

Action.—Stomachic, carminative, emmenagogue. *Dose.*—10 to 30 grs.

Enters into.—Decoct. Aloes Co., Mist. Ferri Co., Pil. Galbani Co., Pil. Rhei Co., and the

OFFICIAL PREPARATIONS

1. **Pilula Aloes et Myrrhæ.**—See Aloes, p. 224.
2. **Tinctura Myrrhæ.**—1 in 5. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr. in emulsion.

NON-OFFICIAL PREPARATIONS

1. **Gargarisma Myrrhæ, B.P.C.**—Tr. Myrrh. 5, Honey 5, Inf. Rosæ to 100. Mix.
2. **Tr. Myrrhæ et Boracis.**—See Borax, p. 182.

PHARMACOLOGY

Externally.—Like other oleo-resins, locally, myrrh is a mild **disinfectant, stimulant and alterative** to the ulcerated and mucous surfaces.

Internally. Gastro-intestinal tract.—The same action is noticed in the mouth, throat, stomach and bowels. It promotes appetite, excites gastric secretion and peristalsis of the stomach and intestines, and is therefore a **stomachic and carminative**.

Blood.—It increases the number of **leucocytes**, perhaps by stimulating lacteal activity. It stimulates phagocytosis.

Elimination.—It is excreted by the mucous membranes, especially those of the **respiratory** and **genito-urinary** tracts, which it stimulates and disinfects; hence it is a **stimulant expectorant, emmenagogue, and uterine stimulant**.

THERAPEUTICS

Externally.—Myrrh is sometimes used in India as a dressing for foul ulcers, or dissolved in human milk as a collyrium for purulent conjunctivitis.

Internally.—Myrrh makes a capital mouth-wash (**Gargarisma Myrrhæ**) for **aphthous** and **ulcerated tongue, relaxed throat and spongy gums**. Its efficacy is increased if combined with borax, as in **Tr. Myrrhæ et Boracis**. For **receded** and **ulcerated gums**, **Tr. Myrrhæ** and **Tr. Iodi** make a superior preparation. For its stomachic and carminative properties, it is often used as an **adjunct** of purgatives in **dyspepsia, constipation, chlorosis, &c.** Combined with iron, it is very effective in **anæmia**. As a disinfecting expectorant, it is occasionally given in **chronic bronchitis** and **bronchiectasis**, and as a stimulant alterative to the mucous membrane, in **cystitis** and **leucorrhœa**. For its emmenagogue property it is largely prescribed in **amenorrhœa**, in conjunction with aloes and iron. Some however doubt its emmenagogue action. Recently Dr. Stroll (Munich) has used the tincture in **diphtheria** with marvellous success. He treated 80 cases, with only one death, by **Tr. myrrh. 1, glycerin 2, water 47 parts**.

NAPHTHOL. Beta-Naphthol

Syn.—Naphthol U.S. Beta-mono-hydroxy-naphthalene.

Source.—Prepared from naphthalene-sulphonic acid.

Characters.—White crystalline laminae or powder, with phenol-like odour, and pungent taste. **Solubility.**—Nearly insoluble in water, 1 in 2 of Alcohol (90 p.c.), 1 in 12 of Olive Oil, 1 in 40 of Glycerin.

Incompatibles.—Camphor, ferric chloride, menthol, phenazone, and phenol.

Action.—Powerful antiseptic and intestinal disinfectant.

B.P. Dose.—3 to 10 grs. in cachets or pills.

NON-OFFICIAL PREPARATIONS

1. **Alpha-Naphthol.** *Syn.*—*Ortho-Naphthol*.—Has three times the antiseptic property of β -Naphthol. More soluble, less toxic, but more irritant. As an intestinal wash, 5 grs. in 1 quart of water. Shoemaker found it useful in gonorrhœa and gleet. *Dose.*—2 to 5 grs.

2. **Acidum Oxynaphthoicum.** *Syn.*—*Naphthol Carbonic Acid*.—In reddish masses. The ointment (10 p.c.) used in scabies and prurigo. *Dose.*— $\frac{1}{2}$ to 3 grs.

3. **Alphol.**—A salicylate of α -naphthol ether. Whitish soluble powder. Acts like salol and betol in articular rheumatism and cystitis. *Dose.*—8 to 30 grs. in cachets.

4. **Asaprol.** *Syn.*—*Abrastol*.—Obtained by acting on β -naphthol-sulphonic acid with calcium carbonate. Acts like sodium salicylate in rheumatism and neuralgia, and as an antiseptic in dyspepsia. Praised as an intestinal hemostatic. It is a test for albumen in urine. The test solution is made by adding 1 part of strong hydrochloric acid to 10 of a 10 p.c. watery solution of Asaprol. 10 drops of this to 1 dr. of urine precipitates albumen, albumoses, and peptones. All other precipitates are dissolved on boiling, except that of albumen. *Dose.*—10 to 30 grs.

5. **Benzonaphthol, B.P.C.** *Syn.*—*Benzoyl-Naphthol*.—A whitish tasteless insoluble powder. Intestinal antiseptic and diuretic, splitting up into β -naphthol and benzoic acid in the intestines. In dyspepsia and typhoid fever. *Dose.*—5 to 15 grs.

6. **Betol.** *Syn.*—*Naphthalol, Betanaphthol Salicylate, B.P.C.*—A salicylate of β -naphthol-ether, in tasteless white crystals, insoluble in water. Splits up into salicylic acid and naphthol in the system. Used in rheumatism and cystitis. *Dose.*—3 to 8 grs.

7. **Epicarin.**—A condensation product of β -naphthol and cresolic acid. A 10 p.c. ointment useful in psoriasis, scabies, and chilblains.

8. **Lactol.**—A β naphthol lactate. More soluble. Acts like benzonaphthol.

9. **Microcidine.**—Obtained by fusing β -naphthol with caustic soda. Whitish, non-toxic soluble powder. Used for lotions and dressings.

10. **Naphthalene.** *Syn.*—*Naphthalinum*.—A coal-tar derivative in white rhomboid crystals insoluble in water. A powerful antiseptic and germicide. Moulded into sticks or blocks, it is sold as *Alabastrine*, moth preventive, *Camphylene*, a stable and urinal disinfectant, &c. Is used externally and internally. As an intestinal disinfectant in dysentery, catarrhal, typhoid, and phthisical diarrhœa. 10 to 20 p.c. solution in oil cures scabies. *Dose.*—2 to 15 grs.

11. **Naphthol c. Camphora.**— β -naphthol 1, Camphor 2. A viscid liquid miscible with oil. A powerful non-toxic antiseptic for wounds and diphtheritic membrane. An intra-pulmonary injection was given with benefit in 3 out of 4 cases. -

12. **Quinaphthol.**—Quinine-Beta-naphthol-sulphate. Yellow crystals sparingly soluble in water. A harmless intestinal antiseptic in *typhoid fever*. *Dose.*—8 to 10 grs.

13. **Ung. Naphtholia, B.P.C.** *Syn.*—*Kaposi's Ointment.*— β -naphthol 1 dr., lard 1 oz., mix.

14. **Ung. Naphtholi Co.**—Naphthol 15, Lard 100, Green Soap 50, Prepared Chalk 10. An improvement upon Kaposi's ointment.

PHARMACOLOGY AND THERAPEUTICS

Naphthol without a prefix should mean β -naphthol not α -naphthol. It is a powerful **antiseptic** and **disinfectant**, both externally and internally. In **scabies**, **ringworm**, **psoriasis** and **chronic eczema**, the ointment having a less unpleasant odour may be used with success instead of tar, which it resembles in action. Internally it is chiefly used for its gastro-intestinal antiseptic property in **dyspepsia**, **pyloric obstruction**, **diarrhoea**, **dysentery**, **cholera** and **typhoid diarrhoea**, especially in the last. The action on the gastro-intestinal canal is local. Most of the drug is excreted in the faeces, only a little being absorbed. If it is largely absorbed, it may cause vomiting, insensibility, nephritis or hæmaturia. It is found in the urine unaltered. It may be given in *cachets* or *pills*, or as an *emulsion* dissolved in oil. The pills may be coated with keratin.

Benzo-naphthol is a very valuable remedy in the treatment of **psoriasis** and also, in combination with resorcin or bismuth salicylate, in the **inflammatory diarrhoea of children**.

NUX VOMICA. Nux Vomica

N.O. *Loganiaceæ*

Syn.—Poison-Nut. **Syn. I. V.**—*Kuchila*, Beng., Hind.

Habitat.—East Indies (India, Ceylon, Cochin China).

Source.—The dried ripe seeds of *Strychnos nux-vomica*.

Characters.—Disc-shaped, $\frac{3}{4}$ to 1 in. in diameter, $\frac{1}{2}$ in. thick, concavo-convex or flat; rounded or somewhat acute at the margin, where there is a small prominence from which a raised line passes to the central hilum. Surface ash-grey covered with short satiny hairs. Endosperm large, horny. Cotyledons small, leafy. Taste intensely bitter. No odour. The *St. Ignatius' Beans* are the seeds of *Strychnos Ignatia*, they are olive-shaped, and contain more strychnine.

Identification.—It resembles no other drug in the B.P. The satiny appearance, the colour, and the flat and circular button-like shape will at once distinguish it.

Composition.—(1) *Strychnine*, 0.2 to 0.5 p.c. varying in different seeds. (2) *Brucine*, 0.5 to 1 p.c. (3) *Ignasuric acid*, with which strychnine and brucine are united. (4) *Loganin*, a glucoside. (5) *Ignasurine*, another alkaloid like the other two. (6) Fat and sugar.

Action.—General tonic and spinal stimulant.

B.P. Dose.—1 to 4 grs. in powder.

OFFICIAL PREPARATIONS

1. **Extractum Nucis Vomicae** (altered and standardized).—Strychnine 5 p.c. Has two-thirds the alkaloidal strength of the extract of B.P. 1885. **B.P. Dose.**— $\frac{1}{4}$ to 1 gr. in pill.
2. **Extractum Nucis Vomicae Liquidum** (new).—Strychnine $1\frac{1}{2}$ grs. in 110 ms. Standardized. **B.P. Dose.**—1 to 3 ms.
3. **Tinctura Nucis Vomicae** (altered).—Standardized. Strychnine $\frac{1}{4}$ gr. in 110 ms. **B.P. Dose.**—5 to 15 ms.

NON-OFFICIAL PREPARATIONS

1. **Inf. Nucis Vomicae** (Ind. Pharm.).—Bruised Seeds 2 drs., Boiling Water 2 ozs., infuso 1 hour. A valuable bitter tonic, to be used with caution. **Dose.**— $\frac{1}{2}$ oz., to be gradually increased to 1 oz.
2. **Brucine**.—In whitish, bitter, acicular crystals, resembling strychnine in pharmacology and therapeutics, but being weaker eliminated sooner. It greatly increases the reflex activity of the spinal centres. Recommended in epilepsy in $\frac{1}{10}$ gr. dose, gradually increased to $\frac{1}{4}$ gr. It is difficult to get it free from strychnine. May be given in solution in water, and spirit, or in pill.

STRYCHNINA. Strychnine



Source.—An alkaloid obtained from the dried ripe seeds of *Strychnos nux-vomica* and other varieties of *Strychnos*.

Characters.—Colourless, inodorous, trimetric prisms. **Solubility.**—1 in 5760 of cold water, but according to Squire 1 in 6000 to 8000 of water. 1 in 150 of alcohol (90 p.c.), 1 in 6 of chloroform. **Impurities.**—Brucine and mineral matter.

Tests.—(1) Watery solution is intensely bitter. (2) Sulphuric acid forms a colourless solution which on addition of potassium bichromate acquires a violet hue speedily passing through red to yellow. (3) Sulphuric acid containing $\frac{1}{2000}$ part of potassium permanganas gives a violet colour with a minute particle of strychnine. (4) Not coloured by nitric acid (absence of brucine, which is coloured blood-red).

Resembles.—Larger forms of crystals of salicylic acid, but can be detected by the above tests and by the general appearance.

B.P. Dose.— $\frac{1}{10}$ to $\frac{1}{15}$ gr. in pill, well triturated with milk sugar, or preferably in solution.

Enters into.—Syr. Ferri Phosph. c. Quin. et Strychnina.

STRYCHNINÆ HYDROCHLORIDUM

Strychnine Hydrochloride. $\text{C}_{21}\text{H}_{22}\text{N}_2\text{O}_2 \cdot \text{HCl} \cdot 2\text{H}_2\text{O}$

Syn. B.P. 1885.—Hydrochlorate of strychnine.

Source and characters.—Obtained from *nux vomica* and other species of *strychnos*. Small colourless, trimetric prisms, efflorescent in the air, very bitter. **Solubility.**—1 in 35 of water, or 1 in 60 of alcohol. **Impurities.**—Sulphates.

OFFICIAL PREPARATION

1. **Liquor Strychninæ Hydrochloridi.**—1 gr. in 110 ms. **B.P. Dose.**—2 to 8 ms., i.e. $\frac{1}{15}$ to $\frac{1}{4}$ gr. of strychnine hydrochloride.

NON-OFFICIAL PREPARATIONS

1. **Strychninæ Acetas.**—Colourless acicular crystals, imperfectly soluble in water. Alternative, antitubercular. **Dose.**— $\frac{1}{60}$ to $\frac{1}{15}$ gr.

2. **Strychninæ Arsenas, B.P.C.**—Small white acicular crystals, soluble in 29 of water. **Dose.**— $\frac{1}{60}$ to $\frac{1}{15}$ gr.

3. **Strychninæ Hydrobromidum.**—White crystals. **Dose.**— $\frac{1}{60}$ to $\frac{1}{15}$ gr.
4. **Strychninæ Nitræs, B.P.C.**—Hard colourless needles, soluble 1 in 67 of water. Successfully used in *nocturnal incontinence of urine, amaurosis, chorea, gastralgia, gastrodynia*. **Dose.**— $\frac{1}{60}$ to $\frac{1}{15}$ gr. **Hypodermic solution.**—1 gr. in 100 ms. of water, dissolved by gentle heat. **Dose.**—2 to 6 ms.

5. **Strychninæ Phosphas Acidus.**—Shining acicular crystals. Soluble 1 in 31.5 of water. **Dose.**— $\frac{1}{60}$ to $\frac{1}{15}$ gr.

6. **Strychninæ Sulphas.**—Prismatic. Soluble 1 in 62 of water. **Dose.**— $\frac{1}{60}$ to $\frac{1}{15}$ gr.

7. **Strychninæ Sulphas Acidus.**—Silky acicular crystals. Soluble 1 in 42 of water. **Dose.**— $\frac{1}{60}$ to $\frac{1}{15}$ gr.

8. **Hypodermic Tablets.**—Contain $\frac{1}{100}$, $\frac{1}{60}$, $\frac{1}{40}$ gr. each of the sulph.

9. **Strychninæ Hypophosphis (Merck).**—White powder, soluble in water. In *tuberculosis and wasting diseases*. **Dose.**— $\frac{1}{60}$ to $\frac{1}{15}$ gr.

PHARMACOLOGY

Externally.—Strychnine is a powerful antiseptic, while brucine is a local anæsthetic.

Internally. Gastro-intestinal tract.—Being intensely bitter, both nux vomica and strychnine are typical stomachics and tonics, increasing the secretion of the gastric juice, and thereby sharpening appetite and promoting digestion like gentian, calumba, &c., but more powerfully. They increase the peristaltic movements of the intestines, and may thus act as purgatives.

Blood.—Strychnine enters the blood from the mucous membrane or when given hypodermically. It is not yet known what effect it has on the living blood-corpuscles, though blood mixed with strychnine and shaken with air contains more oxygen and less carbonic acid.

Heart and circulation.—The heart is powerfully stimulated by influencing (a) the cardiac centre, and (b) the cardiac muscle. In minute doses it strengthens the heart-beats. The blood-pressure is greatly raised, partly by (a) direct stimulation of the vaso-motor centre, thus contracting the vessels all over the body; (b) by indirect or asphyxial stimulation of the vaso-motor centre, due to the saturation of the blood with carbonic acid; and (c) by obstruction to the circulation and increase of peripheral resistance due to muscular spasm. The heart beats for a while after the respiration has stopped, but remains contracted after death.

Respiration.—It powerfully stimulates the medullary and spinal respiratory centres, rendering the respiration deeper and quicker. The latter becomes so active after the administration of strychnine, that if the cord of an animal is cut below the medulla, the respiration is not entirely stopped, as usually happens; again, if the drug is given after the section of the cord, respiration returns. The respiratory muscles participate in the general tetanus, and the patient dies asphyxiated from the rigidity of the thoracic muscles and diaphragm.

Temperature rises slightly during the convulsions.

Brain.—The convulsions are not affected, the mind remaining clear till the last. In minute doses, it is said to strengthen the mental powers, and to sharpen the senses of sight, smell and hearing, perhaps by stimulating the sensory nerve-centres.

Medulla and cord.—Strychnine excites the three important centres in the medulla, viz.—(1) the respiratory, (2) the cardiac and (3) the vaso-motor. In large doses it produces tetanic convulsions, which are entirely due to the great excitability of the motor nerve-cells of the spinal cord and exaggeration of the conductive power of the cord generally. It has been experimentally proved that these convulsions are not caused by stimulation of the cerebrum, the motor and sensory nerve-trunks, or the muscles. The reflex excitability is heightened so much, that the slightest stimulus, as a breath of air, or a loud sound, is enough to cause spasms.

Nerves and muscles.—The motor nerves and the muscles are unaffected, but in toxic doses the functional activity of the motor nerves is depressed towards the end. This is not due to the exhaustion of the nerve tissue as has been supposed, but to the direct action of the drug on the nerves themselves. In moderate doses its local application stimulates local, motor and sensory nerves.

Metabolism.—The increased movements of the body naturally excite oxidation, and the absorption of oxygen and excretion of CO_2 are correspondingly increased. These effects are not due to metabolism of cells but are the results of the changes in the central nervous system. Glycogen in the liver and of the muscles is considerably reduced during the spasm, and may disappear altogether if the spasms be of some duration. Sugar is also passed in the urine of animals experimented upon. This at one time was supposed to be a specific action but has latterly been proved to be due to partial asphyxia.

Genital organs.—In moderate doses, it produces sexual desire, and it is therefore an aphrodisiac.

Elimination is very slow, the drug clinging to the viscera, especially the brain, for days together. If the dose, however small, is frequently repeated, it accumulates in the body, hence strychnine is cumulative. It is eliminated in the urine, partly unchanged, and partly as a strychnic acid.

Toleration.—Some persons are more tolerant than others. Some people of India are in the habit of taking *nux vomica* morning and evening with *pán*, commencing with $\frac{1}{2}$ gr. they sometimes increase it to about 20 grs. (an entire nut).

Toxic action.—Within $\frac{1}{2}$ to 1 hour after a large and poisonous dose, the symptoms of poisoning commence. General uneasiness and soreness of the limbs, instantly followed by shooting pains in the back and then down the arms and legs are first observed. Tetanic convulsions of the muscles soon set in, lasting for $\frac{1}{2}$ to 1 minute when they relax, leaving the patient sweating and exhausted. They come on again and again, and the intermission gets shorter and shorter as the severity of the symptoms increase. The muscles of the jaw are only affected before death, **not in the beginning**. In short, the symptoms of poisoning closely resemble those of tetanus, from which they differ in (1) their rapid development, (2) want of a history of a wound, operation, &c., as in tetanus. (3) Complete relaxation between the spasms in strychnine poisoning, whereas in tetanus the muscles of the back and jaw remain rigid between the spasms. (4) Trismus or “lock-jaw” only appears as a late symptom, whereas it is the first symptom in tetanus. (5) Death taking place soon, or the symptoms rapidly declining. Half a grain is the smallest dose that has been known to prove fatal.

Antidotes.—Pump before convulsions, or under chloroform after convulsions; Apomorphine $\frac{1}{6}$ to $\frac{1}{2}$ gr. subcutaneously, or emetics; charcoal, tannin in large quantities, solution of iodine; potassium bromide (2 drs. to 2 ozs.) with chloral hydrate (30 to 60 grs.) repeated if necessary; morphine, alcohol in poisonous doses (Whitla); chloroform or amyl nitrite, inhalation, artificial respiration, &c.

Antagonists.—Chloral and morphine are not strict antidotes to strychnine, as they act on the cerebrum. Gelsemium and calabar bean are more suitable.

Methyl and Ethyl compounds of Strychnine and Brucine.—Remarkable results have been obtained by Fraser and Crum Brown when strychnine and brucine were combined with methyl and ethyl radicals. These new compounds **lose** their **convulsant** action, which they ordinarily possess when uncombined, and produce **general paralysis** of the body by acting on the ends of the motor nerves, like curare. In poisoning by any of these compounds, the heart continues to beat normally for a long time, and the muscles of the body remain for hours flaccid and contractile. Hence ethyl and methyl compounds of strychnine and brucine may be injected in strychnine poisoning as antidotes.

THERAPEUTICS

Externally.—Strychnine is too poisonous to be used on an abraded surface. Mustard oil, in which some *nux vomica* seeds have been fried, has been used by the writer as a stimulant local embrocation over paralysed muscles.

Internally. Gastro-intestinal tract.—*Nux vomica* and strychnine are highly prized remedies for promoting appetite and digestion in **atonic dyspepsia**, and **weakness of digestion** during convalescence

from acute illness, such as fever, pneumonia, bronchitis, &c. Tr. nucis vomicæ or liqr. strychninæ hyd. and infusion of calumba or infusion of gentian, makes a very efficient prescription for such cases. **Acidity, heartburn, or flatulence** is frequently relieved if the tincture is given $\frac{1}{2}$ hour before food. Strychnine has given satisfactory results in acute and chronic **gastric catarrh**, and **gastralgia** ($\frac{1}{100}$ gr. hypodermically). Because it increases peristalsis, nux vomica has been frequently given as an adjunct to purgatives. Sometimes it corrects **constipation** without the aid of other remedies. Strychnine has been found to cure **prolapsus ani**, especially if associated with constipation.

Heart and circulation.—As a cardiac and vascular stimulant and tonic, both nux vomica and strychnine are invaluable in **cardiac failure** or in urgent **failing compensation**, from whatever source it may arise. Either may advantageously be combined with caffeine or digitalis according to the nature of the case. In urgent cases, strychnine ($\frac{1}{30}$ gr.) must be hypodermically injected. In fact, it is the only reliable drug in cases of sudden emergency. Hypodermic injection sometimes cures collapse due to cholera or snake-bite. According to Anstie, it cures coldness of hands and feet. In **narcotic** and **chloroform** poisoning strychnine injection keeps up the action of the heart and respiration.

Respiration.—Strychnine helps expectoration by strengthening the expulsive force, and stimulating the respiratory centre, as in **chronic bronchitis, protracted pneumonia, phthisis, emphysema, &c.** It may advantageously be given along with expectorants. It checks **phthical night-sweats**, perhaps by stimulating the respiratory centre, and averts death in **chloroform poisoning** ($\frac{1}{30}$ gr. hypodermically).

Nervous system.—As a powerful spinal stimulant, it is mainly used in diseases of the nervous system.

1. Paralysis.—Strychnine is of signal service in (a) **paresis** or **incomplete paralysis**; (b) **functional paralysis** or **paralysis of reflex origin**, as facial palsy, hemiplegia, paraplegia, &c.; (c) **local paralysis** as that of the forearm, larynx, sphincter, eyes due to any toxic agent, as lead, alcohol or tobacco (intramuscular subcutaneous injection $\frac{1}{30}$ to $\frac{1}{20}$ gr. sometimes gives excellent results); (d) **diphtheritic paralysis**; (e) **infantile paralysis**. But the following conditions contra-indicate its use:—(a) When the paralysis is of recent origin. (b) When rigidity of muscles still exists. (c) When there is much wasting of muscles. (Sometimes progressive muscular atrophy is stayed in its progress by the hypodermic injection of $\frac{1}{60}$ gr. increasing to $\frac{1}{30}$ gr., given once daily.) (d) When head symptoms are present. And (e) when the muscles do not respond to electricity. The results obtained in the treatment of nervous diseases have been very uncertain. The great point to remember is that when there is no lesion of the anterior cornua it is scarcely indicated. Moreover if there be active

mischievous going on in this part, stimulation by strychnine is likely to do more harm than good. Always bear in mind Hilton's law of "Rest for the inflamed organ."

2. Sensory paralysis.—It is of no value in such paralysis, but the hypodermic injection over the temporal region sometimes benefits amaurosis.

3. Chronic nervous disorders.—The improvement that is noticed at times in chorea, neuralgia, insomnia, chronic alcoholism, is due more to the improvement of digestion, than to any specific action. In hysteria accompanied by undue excitability of the peripheral sensory nerves, it is positively injurious. Strychnine, whether given by mouth or subcutaneously, relieves drink craving.

Besides the above, nux vomica, or strychnine can be successfully employed in **atonic conditions of the bladder** and **sexual debility**. Strychnine is sometimes injurious in debility from sexual excess, though bromides do good. In mental depression from overwork it should be used after the suspension of work. A drop of the tincture in a teaspoonful of water given every 5 or 10 minutes for about 8 doses and then at longer intervals decidedly improves *sick-headache* (Ringer). It is said to be of immense value in obviating and controlling **post-partum hæmorrhage** and **menorrhagia**.

Mode of administration.—Nux vomica and strychnine are best given as *pills* or *mixtures*. Hypodermically Liq. strych. Hydrochloridum (2 to 4 ms.) or the nitrate can be used. Strychnine should not be given per rectum. Brunton recommends a good **dinner pill** with Ext. Nucis Vom. $\frac{1}{2}$ gr., Pulv. Ipecac. $\frac{1}{2}$ gr., Pil. Rhei Co. 4 grs. : m. ft. pil 1. To be taken before dinner. As a tonic after malarial fever the writer combines it with acid nitro-hydrochloric. dil. and infusion of chiretta as in the formula :—Tr. Nucis vomicee 2 drs., Acid. Nitro-Hydrochlor. dil. 2 drs., Quin. Hydrochloride 24 grs., Spt. Chloroform 2 drs., Inf. chiretta ad 12 ozs. Mist. One ounce thrice daily $\frac{1}{2}$ hour before food.

OLEUM OLIVÆ

Olive Oil. N.O. *Oleaceæ*

Habitat.—South of Europe (introduced on the Himalayas and Nilgiris).

Source.—The oil expressed from the ripe fruits of *Olea europæa*.

Characters.—Pale yellow or greenish-yellow, with faint odour and bland taste. Sp. gr. 0.914 to 0.919. Congeals partially at 32° F. *Impurities.*—Cotton-seed and other oils.

Composition.—(1) *Olein*, a fluid oil composed of Oleic Acid and Glyceryl, 93 p.c. (2) *Linolin* 7 p.c., the glyceride of linolic acid. (3) *Palmitin*, a solid oil composed of palmitic acid and glyceryl.

Action.—Nutritive, biliary lithontriptic and mild laxative. *Dose.*— $\frac{1}{2}$ to 1 oz. or more.

Enters into.—Emp. Ammoniacum Hyd., Emp. Hydrargyri, Emp. Picis, Emp. Plumbi, Lint. Ammoniae, Lint. Calcis, Lint. Camphoræ, Ung. Capsici, Ung. Hydrargyri Co., Ung. Hydrargyri, Ung. Resinæ, besides hard soap, soft soap, and glycerin.

NON-OFFICIAL PREPARATIONS

1. **Oleum Olivæ c. Acido Oleico.** *Syn.*—*Liparin.*—Olive oil containing an additional 5 p.c. of oleic acid and flavoured with essential oil of almonds. A substitute for cod-liver oil. *Dose.*—1 to 2 drs.
2. **Mistura Olei Olivæ.**—Olive oil 1 oz., Tragacanth Powder 15 grs.; Syrup 1 oz., Water to 4 ozs. *Dose.*—1 to 2 ozs.
3. **Maltolivine.**—A combination of olive oil and maltine. Palatable and cheap. Used as a substitute for cod-liver oil in *phthisis*, *ricketts*, and *nutasmus*. *Dose.*—2 to 4 drs.
4. **Emulsio Olei Olivæ Co. B.P.C.**—Prepared in the same way as Emulsio Olei Morrh. Co., see p. 501, substituting olive oil for cod-liver oil.

PHARMACOLOGY AND THERAPEUTICS

Externally.—Olive oil is a bland **unirritating** fixed oil which may be used as an inunction for rendering the skin soft, smooth and supple. It is therefore an excellent **emollient** in dry skin diseases, such as **psoriasis** and **xeroderma**. It is a basis for liniments and ointments, and as a **lubricating** agent is employed in massage. It softens and aids the removal of the **scabs of eczema, favus, &c.**, and protects the skin from the irritating effects of urine, faeces and acrid discharges. It checks **debilitating sweating** when rubbed into the surface of the body. In the same way, when mixed with 4 or 5 p.c. of phenol, it can be used as a **disinfecting inunction** in the desquamative stage of scarlatina, small-pox and plague. To prevent the spread of ring-worm, weak carbolic oil is a capital application. Lin. calcei is a soothing protective to **burns and scalds**. It is absorbed by the cutaneous lymphatics, and **gives nutrition** to the tissues, but not to the same extent as is done by cod-liver oil (*q.v.*).

Internally.—As a topical demulcent, it is useful in **irritant poisoning**, except by phosphorus. In small doses, it undergoes the same changes in the intestinal canal as cod-liver oil and is absorbed. In the tissues, its action is also identical with that of cod-liver oil, with the differences already alluded to. It is therefore a **nutrient** and a **food**, and can be given in wasting diseases. In large doses (1 to 2 ozs.) it is a **mild laxative**, producing painless, soft stools, and is of great value in **inflamed and ulcerated piles, rectal ulcers, anal fissures**, and **constipation**, especially if produced by opium. It acts also as a **laxative** when given as an **enema** (4 ozs. to $\frac{1}{2}$ pint of starch mucilage), in **faecal impaction** and **intestinal obstruction**. Because the cholesterine of the gall-stones is soluble in pure olive oil at the normal bodily temperature, it has been strongly recommended as a **solvent for gall-stones**, on the supposition that some of the constituents of the oil are excreted with the bile. 10 to 20 ozs. or even more of the oil have thus been given daily to those who suffer from **biliary calculi**, sometimes with good results. It is said that in 6 oz. doses, 12 hours after a blue pill, it has caused gall-stones to pass out. It can be taken with food.

OLIVERI CORTEX

Oliver Bark. (*Ind. and Col. Addendum*)

Syn. B.P.—Black Sassafras.

Habitat.—Australasian Colonies.

Source.—The dried bark of *Cinnamomum oliveri*.

Characters.—About 8 in. long, $1\frac{1}{2}$ in. wide; flat, covered with granular periderm of a deep orange-brown colour. The tissue beneath and the bark inside are amber brown. Odour aromatic, spicy. Taste agreeable, spicy, camphoraceous.

Action.—Aromatic.

OFFICIAL PREPARATION

1. **Tinctura Oliveri Corticis.**—1 in 10 of Alcohol (60 p.c.). **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.

PHARMACOLOGY AND THERAPEUTICS

It is used for the same purposes as cinnamon and sassafras.

OPIUM. Opium

N.O. *Papaveraceæ*

Syn. L V.—*Afin*, Beng. Hind, *Ahisen*, Sans.

Habitat.—Asia Minor, China, Persia, and India (Behar and Malwa).

Source.—The juice obtained by incision from the unripe capsules of *Papaver somniferum* (white poppy), inspissated by spontaneous evaporation.

According to the B.P., any suitable variety of opium may be employed as a source of tincture and extract of opium of the respective alkaloidal strengths, provided that when dry it contains not less than $7\frac{1}{2}$ p.c. of anhydrous morphine, but, when otherwise used for officially recognised purposes, opium must be of such a strength that when dried and powdered it shall yield by the official method *not less than* $9\frac{1}{2}$ to $10\frac{1}{2}$ p.c. of anhydrous morphine. Opium containing more morphine may be diluted to that strength with any opium containing between $7\frac{1}{2}$ and 10 p.c. of morphine or sugar of milk.

Characters.—Rounded, irregular or flattened masses, from 8 ozs. to 2 lbs. When fresh, plastic; and internally moist, coarsely granular to nearly smooth, reddish- or chestnut-brown, but becoming harder on keeping and darkening to blackish-brown. Odour strong, characteristic. Taste bitter. **Impurities.**—Excess of water, stones, brick-dust, fruits, leaves, starch, &c.

Varieties.—(1) *Asia Minor opium*, known also as Smyrna, Turkey, and Levant opium, having the above characters, but covered with poppy leaves and fruits or seeds of *Rumex*. (2) *Constantinople opium* includes sometimes Turkey and Levant opium, in cakes or lenticular masses with a poppy leaf, but without *rumex* seeds. (3) *China opium*, i.e. what is produced in China is rarely met with at Calcutta. (4) *Persian opium* in sticks or lumps. (5) Indian opium as manufactured by the Indian Government is of three kinds. (a) *Provision opium* for China in balls covered with poppy leaves. (b) *Abkari or excise opium* for India in square cakes covered with Nepal paper. (c) *Medical opium* in cake and powder is made in Patna from (a) and (b), the highest in consistence and colour

being selected. Besides, there are Egyptian, German, French, and English varieties.

Manufacture of opium.—It is prepared in India as follows: As soon as the capsules of cultivated poppy plants are fully developed, they are scratched in the afternoon by a scarifier, which consists of 4 to 6 iron blades tied together slightly apart. A milky juice immediately exudes from these vertical parallel incisions, and is allowed to flow and thicken during the night. Early next morning it is scraped off by an iron scoop and is collected into an earthen vessel. The incisions are repeated as long as any milky juice flows. The collected juice is evaporated and purified to the required consistence and then brought to the Government factory, where it is examined as to its purity, colour, odour, consistence, &c. The poppy petals are made into cakes to form the inner and outer coverings of the balls.

Composition.—The chemistry of opium is complex. It consists of:

(1) *Primary alkaloids*, 18 in number:—

<i>Morphine</i> about 12 p.c.	<i>Pseudo-morphine</i>	<i>Meconidine</i>
<i>Codeine</i> about .3 to 1.9 p.c.	<i>Cryptopine</i>	<i>Rhœadine</i>
<i>Thebaine</i> about .3 p.c.	<i>Protopine</i>	<i>Codamine</i>
<i>Anarcotine</i> or <i>Narcotine</i>	<i>Hydrocotarnine</i>	<i>Gnoscopine</i>
<i>Narceine</i>	<i>Laudanine</i>	<i>Lanthoptine</i>
<i>Papaverine</i>	<i>Laudanosine</i>	<i>Xanthaline</i>

(2) *Secondary alkaloids or Derivatives*, 8 in number:—

<i>Apomorphine</i>	<i>Apocodeine</i>	<i>Thebenine</i>	<i>Cotarnine</i>
<i>Oxydimorphine</i>	<i>Desoxycodeine</i>	<i>Thebaicine</i>	<i>Rhœadenine</i>

(3) *Neutral Substances*, 3 in number:—

<i>Opianin</i> or <i>Meconin</i>	<i>Meconiasin</i>	<i>Porphyroxin</i>
----------------------------------	-------------------	--------------------

(4) *Organic Acids*, 3 in number:—

<i>Meconic acid</i>	<i>Thebolactic acid</i>	<i>Acetic acid</i>
---------------------	-------------------------	--------------------

(5) *Water*.—About 16 p.c.

(6) Resin, glucose, fats, caoutchouc, essential oil, odorous substances, and salts of ammonium, calcium, and magnesium.

Variation in composition.—The percentage of morphine varies in Patna opium from 3 to 5, and in Smyrna opium from 5 to 10½, whereas that of narcotine in the former 4 to 6 and in the latter 1 to 2.

Incompatibles.—Tannic acid and astringent vegetable preparations, salts of zinc, copper, iron, arsenic, lead, and silver. Alkalis, their carbonates, and ammonia.

Tests.—Add a weak solution of Fe_2Cl_6 to an aqueous solution of opium, when it at once assumes a blood-red colour, due to the presence of meconic acid. This colour is not destroyed by HCl (distinction from acetates) or by Hg_2Cl_2 (distinction from *Sulphocyanides*).

Morphine gives a beautiful greenish-blue colour with a dilute solution of Fe_2Cl_6 .

Porphyroxin, first described by Merck, is found in Smyrna and Bengal opium and turns purple in the presence of HCl.

B.P. Dose.—¼ to 2 grs.

OFFICIAL PREPARATIONS

1. **Emplastrum Opii.**—1 in 10. A hard brown solid. A local sedative.

2. **Extractum Opii.**—2 in 1. (Morphine 20 p.c. Standardized.) Aqueous. Dark brown. General sedative, hypnotic, &c. **B.P. Dose.**— $\frac{1}{2}$ to 1 gr.

From Ext. Opii is made :—

3. **Extractum Opii Liquidum.**—1 in 13 $\frac{1}{2}$. Morphine 0.75 p.c. in 110 ms. Dark brown. Standardized. **B.P. Dose.**—5 to 30 ms. A weak substitute for **Liqr. Opii Sedativus** (Battley).

4. **Pilula Plumbi cum Opio.**—1 in 8, or 12 $\frac{1}{2}$ p.c. of opium. Astringent, narcotic. Ought to be freshly prepared. **B.P. Dose.**—2 to 4 grs.

5. **Pilula Saponis Composita.**—1 in 5, or 20 p.c. of opium. A light brown mass. **B.P. Dose.**—2 to 4 grs. More soluble than solid opium.

6. **Pulvis Cretæ Aromaticus cum Opio.**—1 in 40, or 2 $\frac{1}{2}$ p.c. of opium. A pale brown powder. Suitable for children as an astringent and carminative. **B.P. Dose.**—10 to 40 grs. ; $\frac{1}{2}$ to 1 gr. for a child 1 year old.

7. **Pulvis Ipecacuanhæ Compositus.** *Syn.*—*Dover's Powder.*—1 in 10, or 10 p.c. opium. A good diaphoretic. **B.P. Dose.**—5 to 15 grs.

From Dover's Powder is made :—

8. **Pilula Ipecacuanhæ cum Scilla.**—1 in 20, or 5 p.c. of opium. A brown mass. Expectorant and narcotic. **B.P. Dose.**—4 to 8 grs.

9. **Pulvis Kino Compositus.**—1 in 20, or 5 p.c. of opium. A dark red powder. An astringent and narcotic. **B.P. Dose.**—5 to 20 grs.

10. **Pulvis Opii Compositus.**—1 in 10, or 10 p.c. of opium. A brown powder. Anodyne and narcotic. **B.P. Dose.**—2 to 10 grs.

11. **Suppositoria Plumbi Composita.**—1 gr. of opium in each.

12. **Tinctura Opii.** *Syn.*—*Laudanum.*—A dark reddish-brown liquid. Standardized to contain 0.75 p.c. of morphine. **B.P. Dose.**—5 to 15 ms. for repeated administration ; 20 to 30 ms. for a single dose. A general sedative, narcotic, and hypnotic.

From Tr. Opii is made :—

13. **Linimentum Opii.**—1 in 27. A black liquid. A local anodyne.

14. **Tinctura Opii Ammoniata.** *Syn.*—*Scotch Paregoric.*—1 gr. opium in 96 ms. Expectorant and anodyne. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr. diluted.

15. **Tinctura Camphoræ Composita.** *Syn.*—*Paregoric, Paregoric Eliar.*—Expectorant, anodyne, and stimulant. 2 grs. opium (containing 10 p.c. morphine) in 1 oz. ; 1 gr. in 240 ms. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr. ; 4 ms. for a child 1 year old.

16. **Unguentum Gallæ cum Opio.**—1 in 13 $\frac{1}{2}$, or 7 $\frac{1}{2}$ p.c. of opium. A soothing anodyne ointment.

N.B.—It is to be noted that the following preparations contain opium though their names do not indicate it :—*Pil. Ipecac. c. Scilla, Pil. Saponis Co., Pulv. Ipecac. Co., Pulv. Kino Co., Sup. Plumb. Co., and Tr. Camph. Co.*

NON-OFFICIAL PREPARATIONS

1. **Enema Opii (B.P. 1885), B.P.C.**— $\frac{1}{2}$ dr. tincture to 2 ozs.

2. **Lint. Opii Ammoniatum, B.P.C.**—Lint. Camph. Co. 6, Tr. Opii 6, Lint. Belladon. 1, Liq. Ammon. Fort. 1, Lint. Saponis to 20. After standing one week filter quickly.

3. **Liqr. Morphine Bimeconatis, B.P.C.**—Morphine 1 $\frac{1}{2}$ p.c. A purified solution of the whole of the alkaloids of opium in a neutral state. *Dose.*—10 to 40 ms.

4. **Meconii Periodidum.**—The above alkaloids combined with excess of iodine. *Dose.*— $\frac{1}{2}$ to $\frac{1}{4}$ gr.
5. **Tr. Opii Crocata, B.P.C.** *Syn.*—*Sydenham's Laudanum.*—It is Tr. Opii with saffron, cloves, and cinnamon water, &c. *Dose.*—10 to 40 ms.
6. **Trochiscus Opii, B.P.C.**— $\frac{1}{16}$ gr. of Extr. Opii in each. *Dose.*—1 to 3.
7. **Vinum Opii, B.P.C.**—Ext. of Opium 5, cloves 0.75, Cinnamon Bark 0.75. Detannated Sherry to 100. *Dose.*—10 to 40 ms.
8. **Confectio Opii, B.P.C.**—Dover's powder 25, Syrup 75. Mix. Contains $2\frac{1}{2}$ p.c. of Opium. *Dose.*—5 to 20 grs.
9. **Nepenthe.** *Syn.*—*Anodyne Tincture.*—Similar, and is given in same dose as Tincture Opii.
10. **Narceina, B.P.C.**—Light white, flexible crystals. Soluble 1 in 400 of water. A mild hypnotic, also useful in *whooping-cough* for checking spasms. Produces no constipation, and less headache than morphia. *Dose.*— $\frac{1}{2}$ to 1 gr. or more.
11. **Narcotina, B.P.C.** *Syn.*—*Anarcotine.*—White inodorous crystalline prisms. Insoluble in water. An antiperiodic, in which respect it resembles quinine. *Dose.*—1 to 3 grs.
12. **Cotarnine Hydrochloride.** *Syn.*—*Stypticin.*—A derivative of narcotine. Primrose-coloured granular crystals, very soluble in water and alcohol. Is allied to hydrastine; it is, in fact, methoxyl-hydrastinine. Useful in *uterine hæmorrhage*, and to check bleeding from the urethra after catheterization. *Dose.*— $\frac{1}{4}$ to $\frac{1}{2}$ gr. internally or hypodermically.

MORPHINÆ ACETAS. Morphine Acetate



Source.—The carefully dried salts obtained by neutralizing morphine with acetic acid.

Characters.—A white crystalline or amorphous powder. *Solubility.*—1 in $2\frac{1}{2}$ (almost) of water, 1 in 100 of alcohol (90 p.c.), 1 in 5 of glycerin.

Incompatibles.—Salts of copper, iron, mercury, lead, zinc, alkaline carbonates, lime water, liq. arsenicalis, potassium permanganate, and substances containing tannin.

Dispensing Hints.—A little acetic acid is to be added to make solution, as the salt loses a little acid on drying. Aqueous solutions deposit basic salts.

Action.—Anodyne, hypnotic, narcotic.

B.P. Dose.— $\frac{1}{8}$ to $\frac{1}{2}$ gr.

OFFICIAL PREPARATION

1. **Liquor Morphine Acetatis.**—1 gr. in 110 ms. Almost colourless. **B.P. Dose.**—10 to 60 ms.

NON-OFFICIAL PREPARATIONS

1. **Injectio Morphine et Atropine Hypodermica, B.P.C.**—Morphine Sulphate 6, and Atropine Sulphate 0.12 in aqua 100. *Dose.*—2 to 8 ms.
2. **Hypodermic Lamels.**—Each contains $\frac{1}{4}$ gr. of Morphine; and $\frac{1}{4}$ of Morphine with $\frac{1}{16}$ gr. of Atropine. These are safer.

MORPHINÆ HYDROCHLORIDUMMorphine Hydrochloride. $C_{17}H_{19}NO_3 \cdot HCl \cdot 3H_2O$ **Syn. B.P. 1885.**—Hydrochlorate of morphine.**Source.**—Hydrochloride of an alkaloid obtained from opium.**Characters.**—Acicular prisms of a silky lustre, or a white powder. *Solubility.*—1 in 24 of cold water, 1 in 50 of alcohol (90 p.c.), 1 in 8 of glycerin.**Incompatibles.**—Similar to Morphine Acetate.**Action.**—The same as those of acetate.**B.P. Dose.**— $\frac{1}{4}$ to $\frac{1}{2}$ gr.**OFFICIAL PREPARATIONS**1. **Liquor Morphinæ Hydrochloridi.** *Syn. B.P.*—*Solution of Hydrochlorate of morphine.*—1 gr. in 100 ms. colourless. **B.P. Dose.**—10 to 60 ms.2. **Suppositoria Morphinæ.**— $\frac{1}{2}$ gr. in each.3. **Tinctura Chloroformi et Morphinæ Composita.**—Chloroform $\frac{1}{2}$ m., Acid. Hydrocyanic. dil $\frac{1}{2}$ m., and Morphine Hydrochlor. $\frac{1}{10}$ gr. in 10 ms. **B.P. Dose.**—5 to 15 ms.4. **Trochiscus Morphinæ.**— $\frac{1}{6}$ gr. in each. *Dose.*—1 to 6.5. **Trochiscus Morphinæ et Ipecacuanhæ.**— $\frac{1}{6}$ and $\frac{1}{12}$ gr. in each. *Dose.*—1 to 6.**NON-OFFICIAL PREPARATIONS**1. **Linctus Morphinæ, U.C.H.**—*Liq. Morph. Hyd.* 3 ms., *Spt. Chloroformi* 3 ms., Glycerin or treacle 60 grs., water to 1 dr. *Dose.*—1 dr., 3 or 4 times or oftener daily. To be swallowed slowly.2. **Linctus Sedativus, B.P.C.** *Syn.*—*Linctus Morphinæ Acidus.*— $\frac{1}{2}$ gr. Morphine Hydrochlor. in glycerin 1 dr. *Dose.*—1 dr.**MORPHINÆ TARTRAS.** Morphine Tartrate $(C_{17}H_{19}NO_3)_2 \cdot C_4H_6O_6 \cdot 3H_2O$ **Source.**—May be prepared by the combination of morphine and tartaric acid in molecular proportions.**Characters.**—A white powder consisting of fine nodular tufts of minute acicular crystals. *Solubility.*—1 in 10 of water.**Action.**—The same as those of the hydrochloride.**B.P. Dose.**— $\frac{1}{8}$ to $\frac{1}{2}$ gr.**OFFICIAL PREPARATIONS**1. **Injectio Morphinæ Hypodermica.**—5 grs. in 110 ms. = 1 gr. in 22 ms. **B.P. Dose.**—2 to 5 ms. hypodermically.2. **Liquor Morphinæ Tartratis.**—1 gr. in 110 ms. Colourless. Action as those of acetate and hydrochloride. **B.P. Dose.**—10 to 60 ms.**ADDITIONAL NON-OFFICIAL PREPARATIONS**1. **Morphina.**—The chief alkaloid of opium. A white crystalline powder. *Solubility.*—1 in 1000 of cold water, 1 in 100 of alcohol, 1 in 10 of oleic acid. *Dose.*— $\frac{1}{16}$ to $\frac{1}{2}$ gr.2. **Heroin.** *Syn.*—*Diacetyl-morphine Hydrochloride.*—A fine white powder soluble in water. A substitute for morphine. A useful hypnotic in heart disease. A good cough sedative. *Dose.*— $\frac{1}{2}$ to $\frac{1}{4}$ gr. in pill.

3. **Peronin.** *Syn.*—*Benzoyl-morphine Hydrochloride*.—A fine white powder soluble in water and alcohol. Hypnotic, analgesic, respiratory sedative in *asthma, phthisis, rheumatism*. *Dose.*— $\frac{1}{4}$ to $\frac{1}{2}$ gr.

4. **Dionin.** *Syn.*—*Ethyl-morphine Hydrochloride* (Merek).—A white crystalline powder, soluble in water. Pleasant substitute for morphine without its undesirable effects. Recommended in morphine habit. *Dose.*— $\frac{1}{2}$ gr. 2 or 3 times daily. Subsequently $\frac{1}{4}$ to $\frac{1}{2}$ gr.

5. **Morphine Hydrobromidum.**—A white amorphous powder. Soluble 1 in 22 of water. *Dose.*— $\frac{1}{4}$ to $\frac{1}{2}$ gr.

6. **Morphine Meconas.**—Minute white acicular crystals. A natural salt of morphia, said to derange the head and bowels less than the other salts. Soluble 1 in 34 of water. *Dose.*— $\frac{1}{4}$ to $\frac{1}{2}$ gr.

7. **Morphine Lactas.**—A white crystalline salt, soluble in water 1 in 8. *Dose.*— $\frac{1}{4}$ to $\frac{1}{2}$ gr.

8. **Morphine Sulphas.**—Colourless acicular crystals. *Solubility.*—1 in 21 of water, freely in hot water. *Dose.*— $\frac{1}{4}$ to $\frac{1}{2}$ gr.

9. **Glycophorm.** *Syn.*—*Glycerole of Heroin*.—Contains $\frac{1}{4}$ gr. of heroin in each drachm of a vehicle consisting of Glycerin 3, Syrup of Roses 4, Water 1. A useful cough linctus. *Dose.*—1 to 2 drs.

10. **Glyco-Heroin.**—A proprietary article of somewhat similar composition. *Dose.*—1 dr.

PHARMACOLOGY OF OPIUM AND MORPHINE

Opium and morphine resemble each other so closely in their actions that one description will suffice for both.

Externally.—Opium to a certain extent depresses the sensory nerves, and is therefore a local **anæsthetic** and **anodyne**, but this fact is denied by many authorities. It is absorbed by the unbroken skin, but more freely by the denuded and exposed mucous surfaces.

Internally. **Gastro-intestinal tract.**—In moderate doses, opium causes dryness of the mouth, tongue and throat from the **diminished secretions**, due to its direct, local and remote action after absorption. In the same way, it acts on the **stomach** *reducing its sensibility, secretion, and peristalsis*. At the outset, it may sometimes cause nausea and vomiting from the irritation of the gastric nerves. As a result of all these actions, appetite fails, digestion is retarded, and pain, if any, is relieved. Afferent impressions or direct emetics can no longer induce vomiting. Entering the intestines, it performs the same functions, but its activity is more marked. The secretion is considerably lessened and the peristalsis is so far reduced or arrested that **constipation** results. The paralysis of the muscular coat of the intestines is due to irritation of the inhibitory nerves of the walls of the bowels through the splanchnics. Hence, it is a **sedative, astringent** and **anodyne** to the bowels. In very minute doses ($\frac{1}{2}$ to 1 m. of Tr. Opii), it has been observed to act as a **purgative**, probably either by lessening the action of the inhibitory nerves, or by diverting stimulus from them to the accelerator nerves of the bowels. Excessively large doses, about 1 dr. of laudanum, injected

into the veins purge by causing tetanic contractions of the intestines. Subcutaneously injected, it is excreted into the stomach.

Blood and circulation.—Morphine enters the blood less rapidly than other alkaloids, and is found in the tissues as an oxidation product, oxydimorphine. What becomes of the other alkaloids is not known. In moderate doses, it **stimulates the heart** by its direct action on the nervo-muscular structure of the organ, and through the cardiac centre; but in larger doses it acts as a depressant, due to its direct local action and the stimulation of the vagus centre, making the **pulse small and slow**. Before death, the depression is so marked that the acceleration of the heart becomes an impossibility; but the death in opium poisoning is *not due to the failure of the heart, but to the paralysis of the respiratory centre*, as will be seen presently. The vaso-motor system is not affected till shortly before death, when the vessels dilate.

Respiration.—The respiratory centre is affected sooner than the cardiac, tending to make the respiration slow and feeble. Finally death takes place from **asphyxia**, when the heart still beats. Hence, it is a **direct paralyser of the respiratory centre**. It reduces the bronchial secretion and pulmonary circulation.

Liver.—Biliary secretion is considerably reduced, causing the stools to be pale or clay-coloured, or jaundice may set in. The amount of sugar in diabetic urine, and that of urea and carbonic acid, according to some authorities, are diminished.

Temperature.—Large doses decidedly lower the temperature.

Nervous system.—The chief action of opium is on the nervous system. In small doses, it **first excites the higher faculties**, by directly influencing the cells of the convolutions, and not the cerebral circulation as is supposed. During this stage, with a few, the excitement is a pure exaltation of feelings, the imagination being pleasantly excited with a sense of happiness and comfort. With others, the intellectual activity is heightened, and they can concentrate their energies better on a particular object. But in the majority of cases, the excitability is not uniform. Extravagant and depraved ideas are often indulged in. **Depression** soon follows excitement, with **drowsiness and sleep**, of course according to the dose. After waking, there is a feeling of headache and nausea. In this stage, the **higher centres** are first **depressed** and then the **lower ones**. Hearing, sight and cutaneous sensibility become blunted, and the sleeper feels no pain. If the dose is large, the excitement is only momentary or absent. **Coma** soon supervenes with a profound depression of the **cerebrum and reflex excitability**, the **pupils being contracted**. Therefore opium is a **stimulant, anodyne, hypnotic, narcotic and myotic**. Its effects on the **cardiac, respiratory, and vaso-motor centres** have already been described. The **vomiting centre** may be stimulated in the beginning.

Nerves and muscles.—The motor cells in the brain and spinal cord are first stimulated and then depressed, as evidenced by restlessness, followed by muscular weakness. The motor and sensory nerves are similarly affected. In the same way, it depresses the afferent nerves of the viscera. There is no complete loss of muscular power or irritability, for even in severe opium poisoning, a patient can be made to walk if supported. Brunton thinks that opium influences the terminal ends of the vaso-motor nerves, and thus diminishes or prevents the reflex dilatation of the vessels caused by local irritation.

It will thus be seen that opium while acting on the brain illustrates the two laws already described on page 157.

Kidneys.—Opium reduces the quantity of urine secreted. Morphine is found unchanged in the urine. There is a chance of morphine being reabsorbed from the bladder, and a probability of its retention in the body, from defective elimination in renal disorders.

Skin.—Opium is a diaphoretic, acting by directly stimulating the sweat glands, and not by its local cutaneous action. It may cause itching and a rash (page 150).

Secretions.—It diminishes every secretion of the body except that of the skin and the mammary glands.

Elimination.—It is excreted by most of the secretions of the body, chiefly bile, milk and urine.

Acute toxic action.—Poisoning by opium is very common in India, especially in Bengal, as there is no restriction to its sale. It is chiefly suicidal, and is more frequent amongst the Indians than the Europeans. In most cases they mix it with oil before swallowing. Excitement in such a case is very brief or none at all. Drowsiness and stupor soon follow. The patient may be roused at first, but soon passes into a profound coma, and no external stimulus can rouse him then. The pupils contract to a pin's point, surface becomes cold and clammy; face and lips livid; pulse very weak and slow; respiration slow, irregular and at the end stertorous; finally the patient dies from asphyxia. A few minutes before death, pupils dilate. P.M. appearances are like those of suffocation.

Diagnosis of opium poisoning.—This falls under the province of medicine. However, a few hints will enable the reader to form a correct diagnosis.

(1) **From alcoholic coma.**—Take a careful history. *Smell of breath* may not help always, as the opium and alcohol may be taken together, or one after the other or some one may pour down the throat. *Pupils* are contracted in opium poisoning, and normal or dilated in alcoholic poisoning. *External stimulus* rouses the patient more readily in alcoholic coma than in opium poisoning. *Stomach-pump* will guide in some cases. (2) **Cerebral hæmorrhage.**—History. *Pupils* are unequally contracted, but, if the hæmorrhage is on the pons Varolii, they may be contracted and render the diagnosis more difficult. *Paralysis* of limbs occurs on one side. *Temperature* generally falls in the beginning and then rises. (3) **Uræmia.**—Coma less profound. *Albumen* in the urine. Sometimes convulsions alternating with coma. Examine for *hypertrophy of the left ventricle, arterio-sclerosis, and retinal changes*. (4) **Diabetic coma** by the breath

and the presence of *sugar* and *diacetic acid* in the urine. (5) **Epileptic coma** after a fit, *coma* less profound, dilatation of pupils. Examine for *Babinski's sign*. (6) **Hysterical stupor** by its characteristic symptoms and history. (7) **Chloroform, ether, and carbolic acid poisoning**, by smell and other special symptoms.

Antidotes.—If opium or morphine swallowed, emetics, stomach-pump, or apomorphine $\frac{1}{10}$ to $\frac{1}{2}$ gr. subcutaneously. Pot. Permanganas is a chemical antidote (1 gr. neutralizes 1 gr. of morphine) and its solution (4 to 8 grs. in 4 to 8 ozs. of water) should be given at once, if the quantity of poison is unknown or large, before emetics or washing. A weak solution of Liqr. Pot. Permanganatis ($1\frac{1}{2}$ dr. to tepid water 1 pint) should be employed as a wash for the stomach. After washing, 1 pint of strong tea or coffee can be injected into the stomach or per rectum. Atropine $\frac{1}{2}$ gr. hypodermically or Tr. Belladonna 30 ms. by the mouth is to be repeated $\frac{1}{2}$ or $\frac{1}{4}$ hour until pupils dilate or pulse quickens. Strychnine $\frac{1}{10}$ gr. hypodermically, repeated every 2 or 3 hours for heart and lungs. Similarly, artificial respiration and inhalation of nitrite of amyl. Alternate cold and hot affusions, flagellations, or taps upon the forehead with finger-nails, sinapisms, electricity, smelling salts to the nose, and making the patient walk to and fro, should be adopted to keep the patient awake. Oxygen inhalation is also recommended. The treatment is to be kept up for several hours until the danger is over. Some authorities recommend washing the stomach now and then as opium is excreted in it, but that is unnecessary, as the quantity is infinitesimal and the exhaustion is rather overmuch.

Chronic toxic action or Morphinomania.—Persons get soon habituated to the use, and can consume large quantities. It is therefore necessary that the patient should remain ignorant of the drug. India, Turkey, Persia, and China are the principal countries where the drug is habitually indulged in. Morphinomania exists also in England. In India opium is either eaten or smoked. Moderate doses (5 to 20 grs.) daily do no harm, but *madak* and *Chandu* smokers are a disreputable set. Moral depravity, emaciation, anæmia, muscular weakness, physical depression, feeble and small pulse, tremor, slight ataxy, loss of appetite, indigestion, sluggish bowels, insomnia, drowsy feeling, sexual impotence, amenorrhœa, small pupils, are the principal symptoms of morphiomania.

Treatment.—*Gradual* reduction is the best plan. Tea, coca bark, ammonia may be given to ward off depression and collapse. Sometimes small doses of alcohol may be necessary. If an opium-eater be suddenly deprived of his accustomed dose of the drug, cerebral excitement, restlessness, pain in the stomach, and a burning sensation in the back give great trouble. These symptoms are due to the formation in the tissues of an acrid irritating substance called "Oxydimorphine." Hence the necessity for gradual reduction of opium so as to allow of the elimination of this product.

Modifying influences.—Many circumstances modify the action of opium (1) *Age*.—Children are more susceptible to poisoning. An infant under 1 year should not have more than $\frac{1}{4}$ to 1 m. of the tincture. (2) *Sex*.—Females suffer more from after-effects than men. To a nursing mother it must be given with caution. (3) *Idiosyncrasy*.—Some cannot take opium without brain symptoms, such as insomnia or delirium, while others suffer

from gastric irritation. The writer had to treat a female in whom morphine 1 gr. hypodermically given, produced fainting, vomiting, and collapse. (4) *Habit*.—Toleration is readily induced. Large doses become necessary to produce the desired effect and gradually lead to *opium habit*. The writer knew a person who used to take 40 grs. of morphine daily. (5) *Disease*.—Acute painful diseases require larger doses. Subjects of Bright's disease cannot bear much opium, and it should be given to them with great caution, also to persons suffering from cardiac, pulmonary, and renal diseases, cerebral congestion, and alcoholism. (7) *Drugs*.—Chloral hydrate, potassium bromide, chloroform, &c., increase its soporific virtue, while belladonna removes constipation, when given in combination.

Difference of actions between opium and morphine.—Though the description of the pharmacology of opium given in these pages applies also to that of morphine, yet there are certain differences, which are detailed below :—

Opium

1. Preparations less soluble, slowly absorbed. Action slow, but more lasting.
2. Its several constituents, such as thebaine, codeine, nactine are convulsants.
3. Action variable on account of varying composition.
4. Constipation, nausea, and indigestion more frequent.
5. Better diaphoretic.
6. Less sedative and less soporific.
7. Greatly reduces the sugar of diabetic urine.
8. Local action more marked on the intestines.
9. Cannot be administered hypodermically.

Morphine

- Preparations more soluble, readily absorbed, action quicker, but not so lasting.
- Morphine not so in man.
- Action definite on account of definite composition.
- Constipation, nausea, and indigestion less frequent.
- Feeble or no diaphoretic.
- More sedative and more soporific.
- Slightly reduces the sugar of diabetic urine.
- Less marked on the intestines.
- Can be administered hypodermically.

Antagonists.—Atropine, caffeine, chloroform, cocaine, physostigmine, strychnine are antagonistic to some action or other of morphine. But the antagonism between morphine and atropine is given below in detail :—

Morphine

- | | |
|--|---|
| <div style="display: flex; flex-direction: column; align-items: center;"> <div>Real</div> <div style="font-size: 2em; margin: 0 5px;">{</div> <div>Apparent</div> </div> | 1. Cerebral convolutions depressed. |
| | 2. Respiratory centre depressed. |
| | 3. Intestinal peristalsis depressed. |
| | 4. Pupils contracted through the pupillary centre in the aqueduct of Sylvius. |
| | 5. Diaphoretic through central nervous system. |

Atropine

- Cerebral convolutions stimulated.
- Respiratory centre stimulated.
- Intestinal peristalsis stimulated.
- Pupils dilated through the paralysis of the ciliary branches of the third nerve.
- Anhydrotic through the terminal nerves in the glands.

Though morphine and atropine are not true antagonists, yet they are **useful antidotes** to each other in poisoning, and are also usefully combined to prevent certain unpleasant symptoms of the former.

Actions and uses of the principal constituents of opium.—(1) *Morphine* is already described. (2) *Codeine* and *Apomorphine* are separately noticed. (3) *Narcotine* or *anarcotine* is not hypnotic, but is said to be antiperiodic in ague. It is the principal constituent of Indian opium. (4) *Thebaine* produces convulsions like strychnine and is not used. (5) *Narceine* acts like morphine, is not much used. (6) *Papaverine opianine*, *cryptophine* act as morphine. (7) *Laudanine*, *Porphyroxin* like Codeine.

THERAPEUTICS

Externally.—Opium is chiefly used as a local **sedative** and **anodyne**. Hot poultices or fomentations containing opium or with laudanum sprinkled, or the liniment, are often employed to allay the pain of **pleurisy**, **rheumatism**, **peritonitis**, **lumbago**, **inflamed joint**, &c. The plaster or the paste of Ext. opii and glycerin aborts **boils** and **carbuncles** when applied early. Opium decidedly soothes the pain of **sores** and **ulcers**. Morphine dissolved in glycerin relieves the pain of **cancers**. Vin. Opii B.P.C. or Ext. Opii Liq., dropped into the eyes, reduces pain of **conjunctivitis**. *Earache* is relieved by laudanum. Opium or morphine suppository and the gall and opium ointment often allay the pain of **anal fissures** and **piles**. Opium injection per rectum relieves **rectal tenesmus**, **urethral spasms**, or **pelvic pains**. **Neuralgic pains** are better relieved when morphine is used hypodermically or endermically.

Internally.—Opium is a remedy *par excellence* for removing pain, subduing excitement and irritation, and inducing sleep.

Mouth and stomach.—Laudanum on a pledget of cotton-wool put within a carious tooth relieves **toothache**. Opium often controls **salivation** due to reflex irritation. Opium or morphine allays **gastric pain** and **vomiting** from whatever cause they arise. Thus it is very useful in gastric **ulcer**, **cancer** and **gastritis** produced by alcoholism. Morphine with bismuth markedly relieves **gastrodynia** with or without heartburn. Reflex vomiting is readily checked by morphine, but not the pure gastric neuralgia, which is benefited by small doses of arsenic.

Intestines.—Of all the drugs we have for **diarrhoea**, opium is the most valuable, both in the acute, chronic and tubercular varieties. In **lienteric diarrhoea** where the half-digested food is simply swept down the canal by the excessive peristalsis, opium acts remarkably well. It is a capital plan to administer one or two doses of opium in diarrhoea or dysentery after the expulsion of the offending matters. It can be combined with other astringents in diarrhoea, and with ipecacuanha in dysentery. In the early stage of **cholera**, especially when preliminary diarrhoea is the prominent symptom, opium may be usefully employed, but not in the cold stage. According to Ringer

a small hypodermic injection of morphine ($\frac{1}{10}$ to $\frac{1}{20}$ gr.) promptly checks **choleraic diarrhoea** of children. In **typhoid fever** it serves a double purpose by controlling wakefulness and delirium and subduing diarrhoea. A rectal injection may sometimes relieve where the ordinary method of administration by the mouth has failed, especially so in **dysentery**. It relieves **intestinal colic** caused by sharp aggravated contractions of the bowels.

Enema Opii is serviceable in various ways, by checking flux, subduing local irritation, pain and spasm of the rectum and neighbouring structures, and setting at rest the pelvic organs. A **morphine suppository** generally averts a rigor likely to follow after **catheterism** or **abdominal operations**. To soothe local rectal pain, an ordinary dose is enough for rectal injection, but a large dose is required to induce sleep.

Heart and blood-vessels.—Being a powerful depressant to the heart, opium must be given with caution in heart disease. There can be no question that unmistakable relief is afforded by morphine injection in the **dyspnoea of heart disease** and of **blood-vessels**, and in **angina pectoris**. A single injection of $\frac{1}{4}$ gr. brings on refreshing sleep from which the patient wakes wonderfully revived; but it cannot relieve **cardiac dyspnoea** caused by the pressure of **serous** and **dropsical fluid**. Nowadays heroin is preferred in all cases of cardiac disease. It is much safer than the ordinary morphine salts. If the kidneys are diseased opium is said to be contra-indicated. Though Osler, Mackenzie and others recommend the administration of morphine in renal dyspnoea and uræmic convulsions, gr. $\frac{1}{4}$ subcutaneously. Opium may also be usefully employed in soothing the pain of **aneurysm** and **intra-thoracic tumours**. Belladonna may be usefully combined to counteract the depressing influence.

On account of its soothing effect on the heart and blood-vessels, it controls hæmorrhage, and is therefore an excellent **hæmostatic** in **intestinal and pulmonary bleeding**. In the former, it is of special value, as it paralyses the peristaltic movements; and in the latter, it not only slows the heart, and reduces blood-pressure, but lessens cough, produces sleep, and removes mental anxieties. Pil. Plumbi c. Opio, or a mixture containing morphine acetate, lead acetate and acetic acid, or opium with ergot and tannic acid may be usefully employed.

Respiratory tract.—Opium relieves *cough* and should not therefore be prescribed indiscriminately. When the cough is harassing and frequent, without much expectoration, and without any tendency to asphyxia or lividity, due to **reflex irritation** either from an intra-thoracic tumour, or from excessive irritability of the nerves, as in pleuritis, opium is justly and admirably indicated. But, when the act of coughing is only to empty the bronchial tubes of the abundant secretion, as in the **bronchitis** of the aged and infirm, or of the weak and young, opium is positively injurious; for it leads to inspissation and retention of the mucus. In **phthisis** where the tubercles press

upon the nerves, and give rise to a reflex cough, opium may be given with benefit. In the same way, by the local application of morphine to the throat, in the form of linctus and lozenge, many reflex coughs can be relieved. Sometimes it gives marked relief to the spasm in **whooping-cough**; $\frac{1}{4}$ to 2 ms. every hour, or $\frac{3}{8}$ gr. every 3 or 4 hours, according to the age of the child, should be continued until the whoop disappears. It should be given with great caution in **asthma**, lest it should create an opium habit, but the writer has seen instances where the habitual use of opium cured asthma. The sharp stitch of **acute pleurisy** or **pleuro-pneumonia** is relieved, as if by a charm, with a hypodermic injection of morphine. **Influenza** and **coryza** are greatly benefited by Dover's powder.

Nervous system.—(1) As a **hypnotic** pure and simple morphine is inferior to chloral hydrate (*see* p. 328), but for sleeplessness due to pain or irritation, it is a sovereign remedy. It is often used in the **insomnia** of acute diseases, in the **delirium** of remittent, typhoid and typhus fevers, of mania and alcoholism, and in the **restlessness** of visceral diseases. But the gradual tendency nowadays is in many of these diseases to combine it with chloral hydrate, either alone or with the addition of bromides, especially so in mania and delirium tremens. Morphine is sometimes used to prolong the anaesthesia of chloroform. (2) Its superior value as an **anodyne** has been long recognised. The list will be too long if we are only to enumerate the diseases where opium can be used as an anodyne. Besides the diseases already mentioned, morphine is given hypodermically with marked relief in **biliary, renal, lead and intestinal colics, sciatica, facial** and other kinds of **neuralgias, severe pleurodynia**. The pains of **fractures, dislocations, or other injuries, of acute rheumatism, dysmenorrhoea, and malignant disease** are only a few instances, where opium or morphine can be most usefully employed. In short, any pain, inflammatory or otherwise, is relieved by opiates. It is to be noted that sufferers from pain can consume large quantities without poisoning. (3) As an **antispasmodic**, opium is sometimes used in epilepsy, hysteria or chorea for various reasons. The writer knows an instance where a heavy opium-eater suffers from epilepsy, which repeats itself in spite of increasing the dose. Morphine suppository or opium enema decidedly relieves **spasmodic stricture**. Its utility in asthma and whooping-cough have already been noticed.

Cord.—The pains and spasms of certain diseases of the cord, such as **locomotor ataxy** are subdued by the subcutaneous injection of morphine. Morphine is sometimes given to arrest the convulsions of **tetanus** and **strychnine poisoning**. A medical man by mistake took 40 ms. of Liq. Strychninae, and 80 ms. of Liq. Morphinæ put a stop to the threatening convulsions, he being a daily eater of morphine $\frac{1}{4}$ gr.

Kidneys.—As morphine is not rapidly eliminated by the diseased kidneys, it should be given with the greatest caution in **Bright's disease**, for instances have occurred where small doses produced fatal results. But a hypodermic injection of $\frac{1}{4}$ gr. of morphine has occasionally been found to remove **uræmic insomnia**, **uræmic convulsions** and **uræmic or cardiac dyspnoea**. As it reduces sugar in diabetic urine, opium, codeine and morphine are employed in **diabetes mellitus**.

Skin.—As a diaphoretic, Dover's powder is used in a variety of diseases, such as cold, influenza and slight inflammatory conditions. It checks the **night-sweats of phthisis**.

Uterus.—Opium is invaluable in arresting a threatening abortion. It must be given in large doses, laudanum in 20 ms. or 30 ms. or the extract in 1 gr. doses every 3, 4 or 6 hours as indicated. Sometimes a suppository or enema succeeds better. When opium fails, morphine with digitalis may succeed. It is also used to relieve after-pains.

Malaria.—It is a fact that opium-eaters are less liable to malarial poisoning, and they enjoy better health in malarial districts. Opium occasionally cures **malarial fever** where quinine fails, or the two drugs combined are more successful than either given alone. The writer has seen a few cases of **elephantoid fever** checked by the habitual use of opium.

Mode of administration.—Opium and morphine can be administered by (1) the **mouth**, as pill, powder and mixture; (2) **per rectum**, as suppository or enema; (3) by the **respiratory tract**, as smoking, such as *madak* or *chandu*; (4) **enepidermically**, as plaster or paste; (5) **epidermically**, as liniment; (6) **endermically**, as dusting of morphine on a denuded surface; (7) **hypodermically**, as hypodermic tablet or solution, when the pain is very severe, such as colic or neuralgia. This has a threefold advantage, (a) the *required effect* is gained by a smaller dose; (b) *constipation* is less liable to take place, and also appetite is not lost; (c) affords *quickest relief*; and (8) an **insufflation** (morphine acetate $\frac{1}{2}$ gr. with starch 5 grs., a grain of boric acid or iodoform may be added) in painful organic disease of the larynx.

Rules regarding the hypodermic injection of morphine:—The physician is only justified in doing this in three conditions. (1) When, in the treatment of an acute disorder, one or a few injections only will be required—(recent wounds, acute illness or acute neuralgias). (2) When the morphia habit, if developed, would be a lesser evil than to allow the patient to suffer the pain and excitement that can be subdued by the drug (cancer, tubercle). (3) When the death agony is accompanied by severe pain.

APOMORPHINÆ HYDROCHLORIDUM

Apomorphine Hydrochloride

**Syn. B.P. 1885.**—Hydrochlorate of apomorphine.**Source.**—This is the hydrochloride of an alkaloid obtained by heating morphine hydrochloride or codeine hydrochloride in sealed tubes with hydrochloric acid. Morphine losing one molecule of water, thus:— $\text{C}_{17}\text{H}_{19}\text{NO}_3 = \text{C}_{17}\text{H}_{17}\text{NO}_2 + \text{H}_2\text{O}$.**Characters.**—Small, greyish-white, shining needles, turning green on exposure to light or air; faintly acid. **Solubility.**—1 in 50 of water, 1 in 50 of alcohol (90 p.c.).**Action.**—Emetic and expectorant.**B.P. Dose.**— $\frac{1}{10}$ to $\frac{1}{6}$ gr. hypodermically as an emetic; $\frac{1}{10}$ to $\frac{1}{4}$ gr. by the mouth as an expectorant. Maximum single dose $\frac{1}{4}$ gr.; maximum daily dose $\frac{3}{4}$ gr.**Dispensing hints.**—Should be dispensed in coloured bottles when given as a mixture.**OFFICIAL PREPARATION**1. **Injectio Apomorphinæ Hypodermica.**—1 gr. in 110 ms., should be prepared fresh. **B.P. Dose.**—5 to 10 ms. (= $\frac{1}{20}$ to $\frac{1}{10}$ gr.).**NON-OFFICIAL PREPARATIONS**1. **Hypodermic Discs.**—Contain $\frac{1}{10}$ gr. in each. Very convenient for use.2. **Syrupus Apomorphinæ (Hydrochloridi), B.P.C.**—Apomorph. Hyd. 0.05, Acid. Hydrochlor. dil. 0.25, Alcohol (90 p.c.) 4.5, Aqua Destill. 4.5, Syrup to 100. **Dose.**— $\frac{1}{4}$ to 1 dr.3. **Apocodeinæ Hydrochloridum, B.P.C.**—A pale brown or greyish powder freely soluble in water. A good expectorant and sialagogue when given hypodermically. **Dose.**— $\frac{1}{10}$ to 1 gr.; $\frac{1}{8}$ to $\frac{1}{2}$ gr. hypodermically. 25 ms. of 1 p.c. solution, which must be neutral.4. **Linctus Apomorph. c. Codeina.**—Apomorphine $\frac{1}{10}$ gr., Codeinæ Phosph $\frac{1}{12}$ gr., Acid. Hydrocyanic. dil. 2 ms. in syrup virg. prune 1 dr.**PHARMACOLOGY****Externally.**—A 1 p.c. solution dropped into the eye causes **anaesthesia**; but it may cause local pain and may induce vomiting from absorption.**Internally. Stomach.**—Apomorphine is a reliable emetic acting directly on the vomiting centre, and not locally on the stomach. It is therefore an **indirect emetic** (see p. 125). Its action is prompt, powerful and complete, and is not preceded by nausea or followed by any appreciable depression. It does not irritate the stomach and produces **emesis** when other emetics given by the mouth fail. $\frac{1}{4}$ gr. given per rectum also induces vomiting.

Heart and circulation.—In medicinal doses it has no action on the heart and blood-vessels, beyond a slight depression from the effect of vomiting, but in large doses it increases the frequency of the pulse, probably by stimulating the accelerator nerves. In toxic doses, the pulse-beats fall from the paralysis of the cardiac muscles.

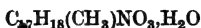
Respiratory tract.—Rossbach's experiments have proved that apomorphine produces a copious secretion from the mucous membrane, without being preceded or accompanied by hyperæmia. This hypersecretion is due to its direct influence on the terminal ends of the gland nerves, gland cells or the minute ganglia, to which it is carried by the blood-current. Thus it renders a thick viscid mucus more liquid. It is therefore a valuable expectorant. Large doses depress the respiratory centre.

Nervous system.—Large doses cause paralysis of the motor nerves, and therefore of the muscles. In moderate doses it first excites the cerebrum causing delirium and finally paralyzes it.

THERAPEUTICS

Internally.—As a prompt and certain emetic, apomorphine is invaluable in poisoning, i.e. in narcotic poisoning, drunkenness, &c. Its effects are most marked in cases where the power of deglutition is lost, and where the emesis cannot be induced by ordinary drugs on account of the depressed condition of the nervous centres by narcotic poisons. For this purpose $\frac{1}{10}$ gr. hypodermically acts often in 1 to 2 minutes; although given by the mouth apomorphine may produce vomiting after absorption, but larger doses are necessary. A plum-stone obstructing the œsophagus was removed by vomiting induced by apomorphine. As an expectorant, it is always given by the mouth. In the early stages of the inflammation of the larynx, trachea and bronchi, when the mucous membrane is dry or secretes a viscid tenacious mucus, apomorphine loosens secretion and removes inflammation. In croup and acute bronchitis of children it is useful. In subacute or chronic bronchitis, broncho-pneumonia, chronic catarrh of larger tubes, or bronchial irritation caused by the inhalation of jute, flax, cotton or other foreign particles, it is most useful if the secretion is scanty and tenacious. A few cases of dry bronchial asthma have been wonderfully relieved by $\frac{1}{20}$ to $\frac{1}{10}$ gr. of apomorphine. It may be given alone or mixed with other expectorants. In whooping-cough it has been found serviceable combined with morphine. Sometimes it can be usefully combined with morphine in the form of a linctus with syrup of Virginian prune, syrup of tar, or syrup of lemon. Murrell has given 1 gr. for 3 or 4 times a day without bad results. Binz says to use $\frac{1}{20}$ to $\frac{1}{30}$ gr.

Caution.—It should be given with great caution to the feeble, the aged, and children, and to those subject to chronic diseases of the heart and lungs.

CODEINA. Codeine

Source.—An alkaloid obtained from opium or morphine.

Characters.—Nearly colourless trimetric crystals. *Solubility.*—1 in 80 of water, 1 in 24 of boiling water, 1 in 2 of alcohol (90 p.c.), 1 in 2 of chloroform.

Action.—Hypnotic, reduces sugar in diabetes.

B.P. Dose.— $\frac{1}{4}$ to 2 grs. Hypodermic injection.— $\frac{1}{4}$ to 1 gr. Maximum daily dose, 20 grs. cautiously increased.

NON-OFFICIAL PREPARATIONS

1. **Codeine Pastils.**— $\frac{1}{4}$ gr. in each. Take 1 when the cough is troublesome.

2. **Codeine Iodate.**—Analgesic. *Dose.*— $\frac{1}{2}$ gr. hypodermically.

3. **Linctus Codeinæ, B.P.C.**—Codeine Phosphate $\frac{1}{2}$ gr. in 1 dr. *Dose.*—1 to 2 drs.

4. **Pilula Codeinæ Comp.**—Codeine $\frac{1}{4}$ gr. (increased to 2 grs.), Ext. Nucis Vom. $\frac{1}{2}$ gr., Ext. Lettuce $\frac{1}{4}$ gr. Mix, for 1 pill. Two or three a day for diabetes.

5. **Codeinum Hydrochloricum, B.P.C.**—A white crystalline powder freely soluble in water. *Dose.*— $\frac{1}{4}$ to 2 grs.

CODEINÆ PHOSPHAS. Codeine Phosphate

Source.—The phosphate of an alkaloid obtained from opium or morphine.

Characters.—White crystals, taste slightly bitter. *Solubility.*—1 in 4 of water, 1 in 200 of alcohol (90 p.c.).

Action.—The same as of codeina.

B.P. Dose.— $\frac{1}{4}$ to 2 grs. Hypodermic injection.— $\frac{1}{4}$ to 1 gr.

OFFICIAL PREPARATION

1. **Syrupus Codeinæ.**—1 in 240. $\frac{1}{4}$ gr. in 1 dr. A colourless syrup. **B.P. Dose.**— $\frac{1}{4}$ to 2 drs.

PHARMACOLOGY

Internally.—Codeine is a **feeble narcotic**, because it does not depress the cerebral convolutions so actively as morphine, but it excites the cord more. It does not produce nausea, vomiting or constipation, but the writer has observed that it often causes costiveness and deficient biliary secretion. It is a **great paralyser of the visceral nerves**, for it has been found that after administration. irritant poisons, such as arsenic, produced neither vomiting nor purging. It decidedly excites both cerebral and spinal motor centres; consequently muscular tremor may follow in spite of its feeble sedative effect. Cautiously increased, it markedly **lessens the amount of sugar in diabetes**, but not so well as opium.

THERAPEUTICS

Internally.—On account of its sedative influence on the visceral nerves, it soothes the **hacking cough of phthisis**, and **visceral neuralgia**. Syrupus Codeinæ is the best to use for allaying cough. Sometimes it is used with advantage in **insomnia** due to pain in some peripheral regions, or to nausea, when it should be given in 1 or 2 gr. doses, every 4 or 6 hours, till sleep comes on. But its chief use is in the treatment of **diabetes mellitus**, in which case it can be given in the form of a pill. The phosphate being more soluble than the alkaloid, can be used in a mixture.

PANCREATIS LIQUOR

Pancreatic Solution

Source.—A liquid containing the digestive principles of fresh pig's pancreas, obtained by digesting 5 ozs. of pancreas freed from fat, and triturated with washed sand or pumice stone, in 20 ozs. of alcohol (20 p.c.) for 7 days.

N.B.—Benger's Liquor Pancreaticus is a similar preparation.

NON-OFFICIAL PREPARATIONS OF PANCREAS

1. **Ext. Pancreatis.**—An American preparation sold in powder, tablets and peptonizing powders.

2. **Pancreatin, U.S.**—Yellow or greyish-white amorphous powder, soluble in water. *Dose.*—2 to 4 grs. **Tablets.**—2½ grs. with sodium bicarbonate in each.

3. **Pilula Pancreatica** (Benger's).—Keratinized. One after meal in pancreatic diabetes.

4. **Pancreatic Emulsion or Pancreatized Fat.**—A milky or creamy preparation obtained by mixing and pounding pig's pancreas with lard dissolving in ether and emulsified by spirit and water. *Dose.*—1 to 3 drs. with milk or water.

5. **Peptonized Milk.**—Dilute 1 pint of milk with 4 ozs. of water, and heat to 130° F. (If a thermometer is not at hand, boil one-half of the mixture and add it to the other half.) To this, add two teaspoonfuls of liquor pancreatis or 5 grs. of extract pancreatis with 20 grs. of sodium bicarbonate and leave the vessel near a fire or hearth for 15 minutes, or in the ordinary temperature of the room for 3 hours. If not used at once, it must be heated to a boiling-point. Fairchild's powder containing both the extract and soda is more convenient. Similarly other liquid foods can be treated. The bitter taste or the milk is covered by soda water, or sweetened and warmed for infants.

6. **Pulvis Pancreaticus Alkalinus, B.P.C.** *Syn.*—*Peptonizing Powder.*—Pancreatin mixed with sodium bicarbonate. In tubes of 25 grs., each of which is sufficient to peptonize one pint of milk.

7. **Trypsin, B.P.C.**—The proteolytic ferment of the pancreas. A whitish powder having an odour like that of pepsin. Converts proteids into peptones in alkaline media. Used for peptonizing milk and in *diabetes*. *Dose.*—3 to 10 grs., in keratin-coated pills.

PHARMACOLOGY AND THERAPEUTICS

Internally.—Normal human pancreatic juice is believed to contain 4 digestive ferments:—(1) *trypsin*, which converts proteids into peptones in alkaline or neutral media; (2) a *milk-curdling ferment*, which curdles casein and peptonizes milk; (3) *amylase*, or *pancreatic diastase*, which changes starch into sugar and dextrin; (4) *steapsin*, a lipolytic ferment which saponifies and emulsifies fat. Both the official and Benger's pancreatic solution contain the first three ferments, and are best suited for predigesting liquid food before administration in **dyspepsia, diarrhoea, gastric dilatation, ulcer and cancer**. Children deprived of natural nourishment fare well on pancreatized food. Benger's food, containing partially dextrinized wheaten flour by dry cooking and impregnated with pancreatic extract, is an excellent diet for such children. Trypsin and desiccated pancreas, in pills coated with keratin, or the Pil. Pancreatica, can be given two hours after meals with 20 grs. of sodium bicarbonate. Keratin protects them from the acid of the stomach. Pancreatic solution is used in **diabetes** originating from pancreatic functional disturbance. *Liquor pancreatis* is mixed with **nutrient enemata** just before injection, or injected into the bladder to disintegrate the blood-clots. Pancreatic emulsion is often given with cod-liver oil in wasting diseases, when the stomach cannot well digest fat.

The application of trypsin to the **treatment of cancer** is now receiving widespread trial, and has hitherto proved a failure. The hypodermic injection of sterilized trypsin solutions is combined with its internal administration.

PAPAIN. B.P.C. (*Non-official*)

N.O. *Cucurbitaceæ*

Syn. I. V.—*Pápyar átá*, Beng.

Source.—Prepared from the juice of the papaw, *Carica papaya*.

Characters.—A whitish, amorphous, slightly granular powder.

Action.—Digests fibrin like pepsin. **Dose.**—1 to 8 grs.

NON-OFFICIAL PREPARATIONS

1. **Elixir Papaini, B.P.C.** **Dose.**— $\frac{1}{2}$ to 1 dr. with meals.
2. **Glycerinum Papain, B.P.C.**—Papain 8, Hydrochloric Acid dil. 8, Simple Elixir 5, Glycerin to 100. **Dose.**—1 dr. with meals.
3. **Trochisci Papain.**— $\frac{1}{2}$ gr. each. **Tablets.**—2 grs. each.

PHARMACOLOGY AND THERAPEUTICS

Papain is used for the same purpose as pepsin and is very useful in cases where there are religious objections to the use of the latter. It is also useful as a vermifuge for ascarides. Locally applied, it causes absorption of diphtheritic exudations. The dry powder may be used or it may be administered in the form of elixir or glycerin.

PAPAVERIS CAPSULÆ

Poppy Capsules. N.O. *Papaveraceæ***Syn. I. V.**—*Postodhenri*, Beng.**Source.**—The nearly ripe dried fruits of *Papaver somniferum*.

The opium-yielding poppy is widely cultivated in India. There are three centres of cultivation, viz. (1) Behar, with Patna as its headquarters; (2) Benares and North Western Provinces, with Gazipur as their central depot; and (3) Central and Western India and Rajputana.

Characters.—Globular or ovoid, with a thin, dry, brittle pericarp 2 to 3 in. in diameter; crowned by stellately arranged stigmas; yellowish-brown, with dark spots. Presents internally thin parietal placentas and numerous, small, reniform, reticulated whitish seeds (*Posto*, Beng., Hind.). Pericarp bitter.

Composition.—(1) *Opium*, a small percentage. The seeds contain a bland oil (*Postor tel*, Beng.) which can be used as a substitute for olive oil.

Action.—Said to be a feeble anodyne and narcotic.

NON-OFFICIAL PREPARATIONS

1. **Decoctum Papaveris**, B.P. 1885.—2 ozs. to 1 pint. 1 in 10. For fomentation to painful parts.

2. **Extractum Papaveris** (B.P. 1885), B.P.C.—A brownish-black extract. Hypnotic without much after-effects. *Dose.*—2 to 5 grs.

3. **Syr. Papaveris**, B.P.C.—1 in 2½ nearly. A dark brown syrup. Sedative in cough mixture. *Dose.*—½ to 1 dr. Not to be given to young children.

PHARMACOLOGY AND THERAPEUTICS

Poppy heads are used in the form of a fomentation to allay pains. The syrup is also occasionally used as a narcotic and hypnotic.

PARAFFINUM DURUM

Hard Paraffin

Syn.—Paraffin Wax.

Source.—Obtained by distillation from shale and separation of the liquid oils by refrigeration and purification of the solid product.

Characters.—Colourless, semi-transparent, crystalline, inodorous, tasteless solid, greasy to the touch. Sp. gr. 0.82 to 0.94. *Solubility.*—Not in water, entirely in ether and slightly in alcohol.

NON-OFFICIAL PREPARATION

1. **Cerosin.**—A hard white paraffin prepared from ozokerit, or earth wax. When artificially coloured it is like **yellow wax**.

USES

In pharmacy it is used as a **basis** for ointments, or as an **excipient** for silver nitrate and permanganate of potash pills.

PARAFFINUM LIQUIDUM**Liquid Paraffin**

Syn. Commercial.—Adepsine Oil, Glymol, Oleum Deelineæ, Paroleine and Chrismaline.

Source.—Obtained from petroleum after the more volatile portions have been removed by distillation.

Characters.—A colourless, tasteless, odourless, oily liquid. Sp. gr. 0.885 to 0.890. Boils not below 680° F. *Dose.*— $\frac{1}{2}$ to 2 drs.

NON-OFFICIAL PREPARATIONS

1. **Emulsio Petrolei cum Hypophosphitibus, B.P.C.**—Liquid Paraffin 33, Acacia Gum 16.5, Oil of Cinnamon 0.1, Tragacanth 1, mix and add water 25. Triturate with calcium and sodium hypophosphites, each 1.75, dissolved in water 15. Finally add elixir of gluside 1, then water q.s. to 100. *Dose.*—1 to 4 drs.

2. **Vasogen and Valsol.**—This is oxygenated petroleum. A vehicle for skin medications. Dissolves camphor, chloroform, creosote, iodine, guaiacol, ichthyol, iodoform, menthol, &c.

PARAFFINUM MOLLE**Soft Paraffin**

Syn. Commercial.—Vaseline, Petroleum Jelly, Adepsine, Chrisma, Cosmoline, Fossiline, Ozokerine, Geoline, and Salvo Petrolia.

Source.—Obtained by purifying the less volatile portions of petroleum and containing soft members of the paraffin series of hydrocarbons.

Characters.—White or yellow, translucent, soft, unctuous, odourless, free from acidity or alkalinity. Melts at 96° to 102° F. *Solubility.*—Similar to hard paraffin. *Impurities.*—Fixed oils, fats, and resins.

Enters into.—Six ointments and the

OFFICIAL PREPARATION

1. **Unguentum Paraffini.**—It should be prepared with the white variety. The yellow variety is to be used as a basis for coloured ointments.

PHARMACOLOGY AND THERAPEUTICS

Externally.—Paraffins neither irritate the skin, nor become rancid, nor are they acted upon by acids, alkalis or oxidizing agents. They are therefore superior to lard, and form a valuable basis for ointments, meant for local action only. As they are very feebly absorbed, they cannot be used as a basis where constitutional action of drugs is intended. Liquid paraffin is a useful solvent for many drugs intended for hypodermic injection. Hard paraffin is used to give consistence to softer ointments, especially in India during the hot weather. As they are non-irritant and do not undergo a change by exposure to the air, they are very useful lubricating and protecting

agents in **psoriasis**, **xeroderma**, **chapped hands** and **nipples**, **eczema**, **sunburn**, &c. Oleum deelinæ has given excellent results in the writer's hands in acute and chronic eczema. Petroleum is locally used with good effect in chronic rheumatism.

Internally.—Cocaine, menthol, morphine, &c., are dissolved in liquid paraffin for application as a **spray** to the throat and laryngeal affections. Some of the liquid varieties are given with the hypophosphites in the form of an emulsion, but beyond their forming a bland basis, very little is known of their effects in the tissues. Internally it is inert.

PARALDEHYDUM. Paraldehyde



Source.—A product of polymerization of aldehyde by various acids and salts.

Characters.—A clear colourless liquid; odour ethereal; taste acrid, afterwards cool; congeals below 50° F.; boils at 255.2° F. *Solubility.*—1 in 8½ of water, and with all proportions in ether and alcohol.

Action.—Hypnotic.

B.P. Dose.—¼ to 2 drs.

PHARMACOLOGY

Externally.—Antiseptic.

Internally.—Paraldehyde is readily absorbed, and manifests its action chiefly on the cerebrum, producing calm refreshing sleep, akin to natural slumber, without after-effects and cardiac depression. It is therefore a pure **hypnotic**, like chloral hydrate, but its action is more speedy. In moderate doses, it **increases the flow of urine**, without deranging the digestive tract, or affecting the cardiac or respiratory centres, which are paralysed only by enormous doses, death taking place from respiratory failure. It is partly eliminated by the breath to which it imparts an unpleasant ethereal odour. A roseolous rash is sometimes noticed on the skin.

Paraldehyde is contained in and is probably the principal therapeutic agent in spiritus ætheris nitrosi. The disagreeable odour sometimes noticed in the breath of patients taking spiritus ætheris nitrosi is due to paraldehyde.

THERAPEUTICS

Internally.—Paraldehyde may be safely used as a hypnotic in **insomnia** of **cardiac** or **respiratory diseases**, **mania**, **hysterical excitement**, **melancholia** and in the *later stages* of **adynamic fevers**, &c. It has been tried in asylum practice and is considered by many to be a valuable remedy. Constant use may produce toleration of the drug.

It is a very useful hypnotic for the purpose of weaning patients from the **morphia habit**, as the unpleasant smell given to the breath

prevents them from indulgence in it surreptitiously. It acts satisfactorily as an enema.

Several cases of rapid relief of **asthma** are recorded.

✱ **Prescribing hints.**—Its pungent disagreeable taste may be disguised by mixing it with syrup and tincture of orange, or giving it in almond mixture, in syrup and peppermint water, or in capsules. Large doses should be emulsified with compound tragacanth powder. Remember that you order sufficient water to dissolve all the paraldehyde, and that a small dose repeated within an hour is better than a single large dose.

PAREIRÆ RADIX

Pareira Root. N.O. *Menispermaceæ*

Habitat.—Brazil.

Source.—The dried root of *Chondrodendron tomentosum*.

Characters.—In long, cylindrical, twisted pieces; $\frac{1}{4}$ to 2 in. or more in diameter; bark thin, blackish-brown with longitudinal furrows and transverse ridges and fissures. Internally yellowish or brownish-grey, with circles of porous wood and large medullary rays. Waxy when cut. Taste bitter. Odourless. **Impurities.**—Spurious Pareira and stems, resembling the root.

Composition.—(1) *Pelosine* or *Buxine*, identical with berberine. (2) Fatty acid. (3) *Starch*, tannin.

Identification.—It should not be mistaken for false Pareira brava root. In the root of *Chondrodendron* there is a large well-marked central column, composed of wedges diverging from a common axis, round which are arranged a few concentric rings intersected by wedge-shaped rays, which are often irregular, scattered, and indistinct. The axis not often centric. In *Cissampelos Pareira* the root and stem are nearly alike in structure, and on transverse section there are concentric rings.

Incompatibles.—Ferric salts, lead salts, and tincture of iodine.

Action.—Diuretic, tonic, and sedative to the mucous membrane of the bladder.

OFFICIAL PREPARATION

1. **Extractum Pareiræ Liquidum.**—Extractives 25 p.c. A black liquid
B.P. Dose.— $\frac{1}{4}$ to 2 drs.

PHARMACOLOGY AND THERAPEUTICS

Internally.—The actions of pareira are not well understood. It is considered to be a **mild bitter tonic**, improving appetite and giving tone to the bowels. It is said to be a gentle **laxative**. The active principle is eliminated by the kidneys which it stimulates, and thus acts as a **diuretic**. During its passage, pelosine soothes and tones the mucous membrane of the genito-urinary tract. It is therefore very useful in **cystitis**, **hæmorrhage from the bladder**, **suppurative renal diseases**, and sometimes in **gonorrhœa** and **gleet**. Hence its actions and uses closely resemble those of buchu. Strange to say, it cannot check bleeding from other organs. In order to get the full

effects, the liquid extract must be given in big doses (2 drs.) with liq. potassæ and hyoscyamus.

PEPSINUM. Pepsin

Source.—An enzyme obtained from the mucous lining of the fresh and healthy stomach of the dog, sheep, or calf.

Characters.—A yellowish-brown or white powder, or pale yellow translucent grains or scales. Odour faint, taste slightly saline. Should be free from any putrescence. **Solubility.**—Moderately in water, and 1 in 100 of alcohol (90 p.c.).

Test.—Should dissolve 2500 times its weight of hard-boiled white of egg, with water acidulated with hydrochloric acid.

Incompatibles.—Alcohol, tannin, alkaline carbonates.

Action.—A digestive adjuvant.

B.P. Dose.—5 to 10 grs.

OFFICIAL PREPARATION

1. **Glycerinum Pepsini.**—5 grs. in 1 dr. A solvent for diphtheritic membrane. **B.P. Dose.**—1 to 2 drs.

NON-OFFICIAL PREPARATIONS

1. **Glyc. Pepsini Fortius.** *Syn.*—*Glycerole of Pepsin, B.P.C.*—Pepsin 3, Hydrochloric acid dil. 1, Glycerin 10, water to 20. Dissolve, add Simple Elixir 1 after decanting. *Dose.*— $\frac{1}{2}$ to 1 dr.

2. **Liquor Pepticus** (Benger's).—A solution of gastric ferments in weak alcohol. *Dose.*—1 to 2 drs.

3. **Liq. Pepticus, B.P.C.**—Glycerin of Pepsin 12·5, Hydrochloric acid dil. 2·5, Alcohol 10, Glycerin 2·5, Water to 100.

4. **Pepsinum Saccharatum, U.S.**—Pepsin U.S. 1, Milk Sugar 9. *Dose.*—1 to 1½ gr.

5. **Pepsin Tablets.**—3 grs. in each. *Dose.*—1 or 2 with meals.

6. **Vinum Pepsinæ, B.P.C.**—Pepsin 3·5, Hydrochloric acid 1·25, Glycerin 5, Sherry q.s. to 100. *Dose.*—1 to 2 drs.

7. **Peptone** (Morck).—A light brown powder soluble in water. A nutrient for invalids, given in enema. *Dose.*— $\frac{1}{2}$ to 1 oz.

8. **Ingluvin.**—Prepared from gizzard of the fowl. In vomiting of pregnancy. *Dose.*—5 to 20 grs.

9. **Rennin.**—Rennet ferment in powder form. 1 gr. dissolved in water $\frac{1}{2}$ oz. will curdle 1 pt. of milk. One **Rennet Tablet** will curdle a quart of milk.

Note.—Chapoteaut of Paris prepares pepsin perles made from the stomach of the sheep. These can safely be given to Mahomedan patients who object to taking pepsin porci.

PHARMACOLOGY AND THERAPEUTICS

Externally.—Medicinal pepsin can convert outside the body in the presence of warmth, moisture and acidity, **proteids** (albumen, fibrin, &c.) into **peptones**, and this action is taken advantage of in predigesting food for administration by the mouth or rectum; but the taste of the peptonized product becomes so unpalatable, that it cannot be ordinarily prescribed. As the rectum has very feeble

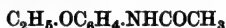
digestive powers, **peptone** and peptonized food form a valuable **nutrient enema**, in a case of rectal feeding. By the following method meat can be peptonized :—Take clean lean meat 8 lb., reduce it to a fine pulp, add water 6 lb., acidulated with hydrochloric acid .2 p.c., and containing pepsin 2 drs. Digest in a porcelain digester for 5 or 6 hours at 120° F., boil and filter. Lastly evaporate the filtrate on a water-bath to the consistence of a soft extract. 30 grs. of this extract with 40 grs. of cacao butter makes a **peptonized meat suppository**, which may be introduced with advantage into the rectum. Glycerinum pepsini has been applied to **diphtheritic false membranes** to cause their solution.

Internally.—A similar process within the stomach, as seen outside, takes place when pepsin is given by the mouth. Though it attacks the albuminoid principles of food like *trypsin*, yet the actions of these two ferments are not identical. Pepsin digests egg albumen more readily than milk, whereas the pancreatic extracts more readily the latter. Pepsin is therefore a **valuable agent in helping the digestion** of those in whom the secretion of the **gastric juice** is deficient from :—

- (1) Disease of the gastric follicles, as atrophy or dilatation.
 - (2) Excessive secretion of mucus, as chronic gastric catarrh, alcoholism.
 - (3) Deficient circulation, as in anæmia, general debility, old age.
 - (4) The irritable conditions of the stomach due to ulcer, cancer, &c
- In cases of gastric ulcer, it is to be given with caution as pepsin might reach the liver unaltered. Pepsin is recommended in **diarrhoea** of children, and some forms of **vomiting** caused by imperfect digestion. It is useless for the digestion of the carbohydrates and fatty food.

Prescribing hints.—Pepsin may be given in powders, pills, cachets, tablets or capsules. Many of the market preparations are worthless, and are therefore to be tested. Being reliable preparations Glycerinum Pepsini and Benger's Liquor Pepticus are the best to use. It should be given with, or directly after, meals, either combined with, or followed by, a dose of Acid. Hydrochlor. dil.

PHENACETINUM. Phenacetin



Syn. B.P.—Para-acet-phenetidin.

Source.—Produced by the interaction of glacial acetic acid and para-phenetidin, body obtained from para-nitro-phenol.

Characters.—White, tasteless, inodorous, glistening, scaly crystals, neutral; melts at 275° F. **Solubility.**—1 in 1700 of cold water, 1 in 50 of boiling water, 1 in 21 alcohol (90 p.c.), slightly soluble in glycerin. **Impurities.**—Acetanilide, para-phenetidin.

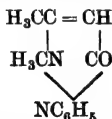
Action.—Analgesic, antipyretic.

B.P. Dose.—5 to 10 grs. As an antineuralgic 15 to 20 grs. Up to 5 grs. to children in cachets or suspended in water with mucilage.

NON-OFFICIAL PREPARATIONS

1. **Phenacetinum Effervesens, B.P.C.**—5 p.c. *Dose.*—1 to 2 drs.
2. **Amygdophenin.**—A derivative of amygdalic acid and para-amidophenol. A greyish-white crystalline powder sparingly soluble in water. *Antirheumatic and analgesic.* *Dose.*—8 to 15 grs.
3. **Kryofin.**—A condensation product of para-phenetidin and methylglycolic acid. Analgesic and antipyretic, sometimes causing severe sweating. *Dose.*—8 to 15 grs.
4. **Apolysin.** *Syn.*—*Mono-phenetidin Citrate.*—A yellowish-white crystalline powder soluble in water, acting like phenacetin. It is harmless even when given in 2 drs. daily. But its analgesic property is inferior to that of phenacetin. Powerfully antiseptic. *Dose.*—10 to 30 grs. or 8 grs. in suppository with cacao butter.
5. **Citrophen.**—A dibasic para-phenetidin citrate. Acts like phenacetin, but the sweating is excessive. *Dose.*—3 to 8 grs.
6. **Lactophenin.**—A derivative of lactic acid and phenetidin. A white, butter, crystalline powder. Analgesic, antipyretic, hypnotic. Found useful in *typhoid fever, erysipelas, migraine, &c.* *Dose.*—5 to 15 grs.
7. **Malakin.** *Syn.*—*Salicyl-para-phenetidin.*—Insoluble in water. Light yellow silky needles. Antirheumatic, analgesic, antipyretic, without any untoward effects. Sometimes acts as a vermifuge. *Dose.*—10 to 20 grs.
8. **Phesin.**—A sulpho-derivative of para-phenetidin. In brownish-yellow, amorphous powder, soluble in water. Acts like phenacetin, without untoward effects. *Dose.*—5 to 10 grs.
9. **Phenocol Hydrochloridum.**—A derivative of glycolol and phenetidin. Colourless crystals, soluble in water. Analgesic, antiperiodic, and intestinal antiseptic. Useful in acute *rheumatism, malaria, typhoid fever, &c.* Externally as a substitute for iodoform. *Dose.*—7 to 15 grs. **Salocol** is a phenocol salicylate given in 10 to 30 grs.
10. **Triphenin.** *Syn.*—*Propionyl-phenetidin.*—A derivative of propionic acid and phenetidin. Colourless, crystalline, sparingly soluble in water. Action like phenacetin. *Dose.*—5 to 10 grs.

PHENAZONUM. Phenazone



Syn.—Antipyrine. Phenyl-dimethyl-isopyrazolone.

Source.—Obtained from phenyl-hydrazine by interaction with acetoacetic ether and the subsequent interaction of the resulting phenyl-methyl-isopyrazolone with methyl iodide.

Characters.—Colourless, inodorous, scaly crystals. Taste bitter. Melts at 235.4° F. **Solubility.**—1 in 1 of water, 1 in 1½ of alcohol (90 p.c.), or of chloroform, 1 in 40 of ether.

Incompatibles.—Sp. æther. nitrosi, nitrites. Tannic acid in solution, cinchona preparations, copper sulphate, iodine, acids, alkalis, potassium

permanganate, corrosive sublimate, sulphate, iodide, chloride of iron, and strong solution of chloral hydrate. Powdered phenazone liquefies when rubbed with butyl chloral hydrate, sodium salicylate, and β -naphthol.

Action.—Analgesic, antipyretic, nervous sedative.

B.P. Dose.—5 to 20 grs.

NON-OFFICIAL PREPARATIONS

1. **Antipyrina Effervescens, B.P.C.**—5 grs. in 1 dr. An agreeable preparation. **Dose.**—(One teaspoonful or more.

2. **Antipyrine Tablets.**—5 grs. in each.

3. **Ferripyrin.** *Syn.*—*Ferropyrin.*—A compound of antipyrine 2, in ferric chloride, useful in chlorosis and *anæmia*. 1 p.c. solution as gonorrhœal injection. Saturated solution, hæmstatic and styptic. **Dose.**—3 to 8 grs.

4. **Hypnal.**—*See* p. 329.

5. **Iodopyrin.**—*See* p. 464.

6. **Migranin.**—*See* p. 294.

7. **Pyramidon.**—A methyl derivative of antipyrine. Yellowish-white crystals, soluble in water. Analgesic, antipyretic. **Dose.**—5 to 8 grs. in solution.

8. **Salipyrin.** *Syn.*—*Antipyrine Salicylate.*—White, sweetish crystals, soluble in water. Analgesic, *anti-rheumatic*. **Dose.**—15 to 30 grs.

9. **Tolipyrin.** *Syn.*—*Tolylantipyrine.*—Action and dose, same as phenazone, but is cheaper.

10. **Tolysal.**—A salicylate of tolipyrin in small white crystals, sparingly soluble in water. Antipyretic, analgesic. **Dose.**—5 to 30 grs.

11. **Tussol.** *Syn.*—*Antipyrine Mandelate.*—White granular crystals, soluble in water. Said to be useful in whooping-cough. **Dose.**—5 to 15 grs. ; 1 gr. for a child 1 year old.

12. **Anilipyrin.**—Obtained by fusing antipyrine 2, with antifebrin 1. Possesses actions of both. **Dose.**—13 to 15 grs.

13. **Acetopyrin.**—A white crystalline powder, being a combination of phenazone and acetic acid. *Anti-arthritic* remedy. **Dose.**—7½ to 15 grs.

14. **Acetophenone.** *Syn.*—*Hypnone*, *Methyl-Phenyl-Acetone.*—A colourless liquid used as a hypnotic and in nervous affections, uncertain in its action. **Dose.**—1½ to 5 ms.

15. **Benzanilide.** *Syn.*—*Phenyl-Benzamide.*—Small white shining scales without smell or taste. Resembles acetanilide in its action, specially useful for children. **Dose.**—3 to 12 grs.

16. **Chinolini Tartras.**—The tartrate of chinoline, which is prepared by the oxidation of nitrobenzene and aniline. White glistening crystals, without smell, but with a nauseous taste. A powerful antipyretic, used in *enteric and remittent fevers* and in *paroxysmal neuralgia*. **Dose.**—5 to 15 grs. (in cachet or with syrup of orange).

17. **Exalgin.** *Syn.*—*Methyl acetanilide.*—Colourless acicular crystals. Antipyretic and analgesic. Chiefly used in *migraine, sciatica, and neuralgias*. **Dose.**—½ to 2 grs.

PHARMACOLOGY OF ACETANILIDE, PHENAZONE AND PHENACETIN

As the actions and uses of these drugs closely resemble one another one description for all will suffice.

Externally.—Both phenazone and acetanilide are local hæmostatics, but the latter is also an antiseptic.

Internally. Gastro-intestinal tract.—No effect.

Blood is not affected by the ordinary doses, but its colour is changed by large doses, owing to the formation of methæmoglobin. The red blood-corpuscles are broken up and the movements of the white blood-corpuscles are arrested.

Heart.—The heart is depressed, probably by its sedative influence on the cardiac muscle. Acetanilide is the most depressant, next comes phenazonum, and phenacetin has little or no depressant action.

Blood-vessels.—Acetanilide and phenazone contract the blood-vessels, by acting directly on their muscular fibres. These are therefore hæmostatics, phenazone being more energetic than the other. The blood-pressure is heightened at first, and is lowered subsequently from cardiac weakness.

Respiration.—The respiratory force is diminished only by toxic doses.

Kidneys.—They slightly increase the flow of urine, urea and uric acid. Large doses cause hæmoglobinuria. Phenazone is quickly excreted. Acetanilide is said to be excreted as aniline.

Skin.—Papular, erythematous, or urticarial rashes are observed at times. They may produce a slight diaphoresis in health, but a copious one in pyrexia. Therefore they are diaphoretics.

Temperature.—They only slightly reduce the temperature of healthy persons, but are powerful antipyretics. This action is mainly due to direct action on the heat-producing centre in the corpus striatum and partly to diaphoresis.

Nervous system.—They are powerful analgesics. Acetanilide and phenazone are said sometimes to cause convulsions and motor paralysis.

Toxic action.—Large doses cause great prostration, sometimes vomiting, weak irregular pulse, slow respiration, and sweating. In toxic doses these symptoms are aggravated, leading to profuse sweating, cyanosis, collapse, and death. Sometimes a rash appears on the skin. Poisoning may occur from phenazone and acetanilide. The writer had a case of poisoning from 30 grs. of phenacetin. Cyanosis of the face, mostly of the lips, hands, and feet, and a slight depression were the only prominent symptoms.

Antidotes.—Warmth to the surface, stimulants, strychnine, and atropine hypodermically, and oxygen inhalation.

Actions of Phenazone and Phenacetin compared.—Phenazone is the best in respect of the efficacy, rapidity and certainty of its action, while phenacetin is safe, and its action more lasting, never producing subnormal temperature or collapse. Phenacetin has also a soothing and soporific action. Both of them cause profuse sweating but do not shorten fever.

THERAPEUTICS OF ACETANILIDE, PHENAZONE AND PHENACETIN

Externally.—Acetanilide and phenazone are occasionally used as a dusting powder, or as an ointment (20 grs. to 1 oz.) for chronic ulcers and eczema. A 10 p.c. solution of phenazone locally applied, stops **epistaxis**. Phenazone hypodermically (5 to 10 grs. in water) relieves the pains of **sciatica**, **lumbago**, **dysmenorrhœa**, **biliary and renal colic**, &c. A 50 p.c. solution in the same way, may be used as a **local anæsthetic**. The smarting caused by the subcutaneous injection may be relieved by combining it with cocaine. The local sores it produces are a drawback to its use.

Internally.—Acetanilide is rarely used nowadays. As an **anæsthetic**, a 30 or 50 p.c. solution of phenazone may be locally applied in sore throat.

As **antipyretics** all three are used to reduce **fever-heat**, but phenacetin, being the safest, is prescribed most frequently. They take about 2 hours to bring down the temperature, but phenazone and acetanilide do it most rapidly. To maintain the reduced temperature they require to be repeated every 4 or 6 hours, and this sometimes leads to dangerous symptoms, on account of their depressing influence on the heart. They cannot control the duration of fever. As soon as the effects are over, the fever rushes up again. Hence many physicians are averse to using them as **antipyretics**, as a routine treatment, but they are really very useful agents when in an acute disease we want to reduce the fever immediately. In **hyperpyrexia** they cannot be relied upon. Both phenazone and phenacetin have been given in every manner of **febrile condition with a high temperature**, such as typhus, remittent, intermittent, sunstroke, exanthemata, erysipelas, rheumatism, pneumonia, phthisis, influenza, puerperal fever, but with unsatisfactory results. The modern doctrine of fever is that it is a protective process. We should therefore never use drugs which check heat production, but should rely, for the reduction of temperature, upon those means which promote the dissipation of heat without influencing its production.

As **analgesics** all three may be given to relieve pain, but phenazone is the most powerful in so doing. For reasons already stated, phenacetin will have a preference. There is hardly any pain which cannot be alleviated by phenazone. 10 to 15 grs. given hourly for 3 or 4 doses act like a charm in almost every form of **headache** and **migraine**. Phenacetin does it equally well in 5 gr. doses. Moreover, the pains of **ataxy**, **sciatica**, **angina**, **internal aneurism**, **dysmenorrhœa** are soon cut short by these drugs. In pleurisy they not only cut short the attack, but relieve the stitch and aid the absorption of the effused fluid.

Phenacetin, in 1 gr. doses, is a useful hypnotic in the febrile diseases of children.

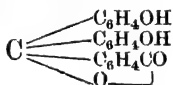
As a **nervine sedative**, phenazone is occasionally used in **epilepsy**, **chorea**, **nocturnal emissions**, **laryngismus stridulus**, **asthma**, **sea-sickness**, **enuresis**, &c.

As a **hæmostatic**, it is given in hæmoptysis, and it is said to rapidly reduce the amount of sugar eliminated in **diabetes**.

Prescribing hints.—All three may be given in powders, cachets, or capsules. Phenazone being soluble in water can be given in peppermint water, which disguises its taste, while the others can be suspended by compound tragacanth powder. Sometimes they may be given with advantage in brandy or whisky. Phenazone relieves pain quicker when subcutaneously injected, or they may be administered *per rectum* if necessary. On account of a long list of incompatibles, phenazone is better given alone.

Note.—Caffeine is rendered soluble in one-half of water by the addition of an equal quantity of antipyrine; and quinine hydrochloride 2 parts, with antipyrine 1 part, will dissolve in 5 parts of water. Without the addition of antipyrine 64 parts of water would be necessary to dissolve 2 parts of quinine hydrochloride.

PHENOLPHTHALEIN. B.P.C.



Syn.—Purgen, Dihydroxy-phthalophenone.

Source.—Obtained by the interaction of Phenol and Phthalic Anhydride.

Characters.—A crystalline substance, soluble 1 in 10 of alcohol (90 p.c.), but only in 600 of water.

Action.—Purgative. *Dose.*—1 to 8 grs.

ACTIONS AND USES

Phenolphthalein in neutral or alkaline solution is colourless, but on the faintest trace of acidity it turns **icate pink**. For this reason it was introduced into the B.P. as a test in the preparation of neutral solutions. Clinically it is used as an indicator in combination with Decinormal Soda solution in the process of estimating the total acidity of gastric contents. Under the fancy name of "*Purgen*," it has recently been introduced as a **purgative**, being specially useful in cases where prompt action is required as in **jaundice**. For ordinary patients $\frac{1}{2}$ to 3 grs. is a sufficient dose, but patients confined to bed may require as much as 10 grs. It has no action on the kidneys and is very safe and efficient in its action, but its use is contra-indicated in cases where there is a tendency to piles.

PHOSPHORUS. Phosphorus. P

Source.—A solid non-metallic element obtained from calcium phosphate.

Characters.—A semi-transparent, wax-like solid, emitting white vapours and luminous in the dark; ignites in the air. **Solubility.**—Insoluble in

water; 1 in 25 of chloroform, 1 in 350 of absolute alcohol, 1 in 80 of olive oil and of ether; 2 in 1 of carbon bisulphide, 1 in 60 of oil of turpentine. Also in melted fats.

Action.—Nervine tonic and general stimulant.

B.P. Dose.— $1\frac{1}{16}$ to $\frac{1}{2}$ gr. in pill or solution.

Enters into.—The preparation of Calci Hypophosph., Acid Phosph. Concent. and the

OFFICIAL PREPARATIONS

1. **Oleum Phosphoratum.**—1 p.c. A clear straw-coloured oil. For its unpleasant taste, it is rarely prescribed. **B.P. Dose.**—1 to 5 ms.

2. **Pilula Phosphori.**—1 in 90. **B.P. Dose.**—1 to 2 grs., i.e. $\frac{1}{10}$ to $\frac{1}{2}$ gr. of phosphorus.

NON-OFFICIAL PREPARATIONS

1. **Elixir Phosphori, B.P.C.** *Syn.*—*Syrupus Phosphori.*—Tr. Phosph. Co. 1, Glycerin 4; mix and agitate. Palatable and well borne by the stomach. *Dose.*—15 to 60 ms. in water. Contains $\frac{1}{10}$ gr. phosphorus in 1 dr.

2. **Perles of Phosphorated Oil.**—Contains phosphorus $\frac{1}{100}$, $\frac{1}{50}$, and $\frac{1}{2}$ gr. in each. *Dose.*—1 after meals.

3. **Tr. Phosphori Comp. B.P.C.**—Contains 1 of phosphorus in 500. Dissolve Phosphorus 1 in chloroform 85 within a stoppered bottle on a water-bath, and then add absolute alcohol to 500, shake well. *Dose.*—3 to 12 ms. Preserve from light.

4. **Zinci Phosphidum, U.S., B.P.C.**—A grey crystalline powder. Recommended as a substitute for phosphorus. *Dose.*— $\frac{1}{20}$ to $\frac{1}{4}$ gr.

PHARMACOLOGY

Phosphorus has a specially interesting physiological action, but its therapeutic value is unfortunately limited. As a poison it is important.

Externally.—Undiluted phosphorus is a strong local irritant and caustic.

Internally.—In its solid form it has the same local action.

Blood.—It is absorbed into the blood partly unchanged, and partly as an oxidized product, phosphorus or phosphoric acid. This oxidation possibly occurs at the expense of the oxyhæmoglobin. Many authorities do not believe this latter theory.

Stomach and liver.—In very minute doses, it is said to sharpen the appetite, and in moderate doses it increases the development of the connective tissue of the stomach and liver, and induces a sort of chronic inflammation of the organs; thus, atrophy of the gastric follicles and cirrhosis of the liver are the results. The glycogenic function of the liver too is greatly reduced, and fatty degeneration ensues. In toxic doses it is a gastro-intestinal irritant, producing vomiting and purging, the vomited matters having a garlic odour. These symptoms do not follow immediately after administration, but may be delayed for hours or days.

Bones.—When continued long in such minute doses as not to affect the stomach or liver, there is an increased osseous deposit, and the cancellous tissue becomes converted into compact bone. These changes are not due to the excess of phosphates produced in the blood, but to the stimulation of the cell growth by the drug itself.

Nervous system.—It is said to act as a **tonic** and **restorative** to the nervous system, supplying it with nutrition, but it is difficult to understand how it can do this, when it arrests oxidation, except on the supposition that it does so by stimulating cell growth, as in the case of bones. It is popularly supposed to excite the reproductive centres in the spinal cord, and is therefore regarded by many as an **aphrodisiac**, but the best authorities have now entirely discarded it for this purpose.

Metabolism.—In large doses, it distinctly increases the nitrogenous products, such as urea, leucin, tyrosin, &c., raises temperature, reduces absorption of oxygen and excretion of carbonic acid, and leads to **fatty degeneration** of the glandular, muscular and epithelial protoplasm throughout the body. The urea, &c., being soluble, are excreted by the kidneys, whose action they increase, but the insoluble products, such as fats and oils, are deposited in the various organs.

Acute toxic action.—Acute poisoning may occur from swallowing rat-paste or lucifer match-heads. Besides gastro-enteritis already described, there is considerable prostration, and occasionally collapse and death. Generally these symptoms come on in a mild form, and the patient does well for a few days. Then, after an interval, jaundice is noticed, with a tender enlarged liver. The jaundice soon deepens; vomiting and purging of dark-coloured blood set in, temperature first rises and then falls; the pulse becomes weak and rapid; the skin cold and clammy; and the urine scanty, high-coloured, and albuminous. Muscular twitchings, convulsions, or coma supervene, terminating in death. **Fatty degeneration of the liver**, with general ecchymoses and hemorrhages, are the common P.M. appearances.

Antidotes.—Stomach-pump, copper sulphate is the appropriate emetic (*see* p. 379). It should be given in 3-gr. doses every 5 minutes till vomiting takes place, and then 1 gr. every quarter of an hour as an antidote. If rejected, give it with morphine solution (10 ms.). Ozonized oil of turpentine 30 ms. every half hour. This acts by converting the phosphorus into hypophosphoric acid. The French turpentine is the best. *New turpentine is worse than useless.* Mag. Sulph. $\frac{1}{2}$ oz. as a purgative, and demulcent drinks may also be given. Avoid fats, butter, and oils, which dissolve phosphorus.

Chronic toxic action.—Chronic poisoning is rare, and occurs only in those workmen who are exposed to the fumes of phosphorus. Gastro-enteritis, fatty degeneration, **necrosis of the jaw**, general tuberculosis are the prominent symptoms. It is asserted that phosphorus fumes attack the bone through carious teeth or spongy gums, but this effect is not produced by its internal administration. Oil of turpentine is an antidote.

THERAPEUTICS

Internally.—The use of phosphorus is limited.

As a nervine tonic, it has been given in **nervous exhaustion** during convalescence from acute illness, **over-taxation of the brain** from prolonged strain and overwork, and such diseases as are characterized by **softening** or **atrophy** of the **nerve-centres**. It is occasionally recommended in functional impotence and in many other nervous disorders, such as neuralgia, melancholia, adynamic conditions following typhoid and remittent fevers, pneumonia, and neurasthenia, &c., but the student is advised to avoid the use of this and all other so-called *aphrodisiacs*, which, as a rule, do more harm than good.

As a restorative or a stimulant to the cell growth, it has been given in affections dependent on malnutrition, such as **anæmia**, **leucocythæmia**, with occasional success. Dr. Kassowitz obtained very good results in the rickets of children; the dose being $\frac{1}{10}$ to $\frac{1}{60}$ gr. *per diem* for a child weighing 12 lb. But Whitla apprehends danger of the bones hardening in their bent condition. It is no doubt useful in **ununited fractures**, *especially during pregnancy*, and in **osteomalacia**. Cases of **tubercular meningitis**, **diabetes**, and **lymphadenoma**, have improved under treatment by this drug.

Prescribing hints.—All phosphorus preparations should be given with caution. It is safe to commence with $\frac{1}{30}$ gr. dose, but in sexual debility large doses such as $\frac{1}{30}$ to $\frac{1}{20}$ gr. are necessary at times. The B.P. oil is best administered with cod-liver oil (30 to 40 ms. in 6 ozs.) in 1 dr. doses. Gelatin capsules or perles containing oil are elegant. Elixir phosphori is the best preparation. Phosphorus is to be given after meals. Sometimes it gives rise to unpleasant eructations.

In **neurasthenia** the following prescription forms a very good combination.—Ferri Redacti 2 grs., Strychnine $\frac{1}{30}$ gr., Pil. phosph. 2 grs., m. ft. Pil. 1 mitte 30. Twice daily after meals.

CALCI HYPOPHOSPHIS

Calcium Hypophosphite. $\text{Ca}(\text{PH}_2\text{O}_2)_2$

Source.—Obtained by the interaction of phosphorus calcium hydroxide and water. $3\text{Ca}(\text{HO})_2 + 8\text{P} + 6\text{H}_2\text{O} = 3\text{Ca}(\text{PH}_2\text{O}_2)_2 + 2\text{PH}_3$.

Characters.—A white, crystalline, pearly salt. Taste bitter, nauseous.

Solubility.—1 in 8 of water, insoluble in alcohol (90 p.c.).

Action.—Nervine tonic.

B.P. Dose.—3 to 10 grs.

SODII HYPOPHOSPHIS

Sodium Hypophosphite. NaPH_2O_2

Source.—Obtained by the interaction of sodium carbonate and calcium hypophosphite. $\text{Na}_2\text{CO}_3 + \text{Ca}(\text{PH}_2\text{O}_2)_2 = 2\text{NaPH}_2\text{O}_2 + \text{CaCO}_3$.

Characters.—A white, granular, deliquescent salt, taste bitter, nauseous.

Solubility.—1 in 1 of water.

Action.—The same as of calcii hypophosphis.

B.P. Dose.—3 to 10 grs.

NON-OFFICIAL PREPARATIONS

1. **Syr. Calcii Hypophosphitis, B.P.C.**—1 gr. in 1 dr. Calcium Hypophosph. 1.75, Distilled Water 45, dissolve and filter. Add and dissolve sugar 80, with the aid of gentle heat. After cooling, add Hypophosphorous Acid 0.25 and Distilled Water *q.s.* to 1 pint. **Dose.**—1 to 4 drs.

2. **Saccharated Wheat-Phosphates.**—The organic phosphates and cerealin of the bran, combined with milk sugar, are useful for weak and rickety children to aid the assimilation of food and such drugs as iron. **Dose.**— $\frac{1}{2}$ teaspoonful or more as sugar with food.

3. **Syrupus Sodii Hypophos. B.P.C.**—Sodium Hypophos. 2, water 2. Dissolve, filter, add Syrup *q.s.* to 100. **Dose.**—1 to 4 drs.

PHARMACOLOGY AND THERAPEUTICS OF CALCIUM AND SODIUM HYPOPHOSPHITES

Internally.—The actions of these salts resemble those of phosphate of lime, but not of free phosphorus. They are probably converted into phosphates in the stomach. Their efficacy in **phthisis** has been doubted, but there is evidence to show that in the first stage they are more useful than in the second or third. In fact, if any benefit is derived from them, it is due to their **general alterative** effects, rather than to their specific action on the disease. They give better results in **chronic bronchitis** with emaciation, profuse expectoration, and sweating in young individuals. They may be used in the same class of diseases in which phosphate of lime is indicated. Parrish's Chemical Food, Fellows' Syrup, Syr. Calcii Lactophosph. B.P. or Glycerophosphate of lime are valuable preparations to select from.

PHYSOSTIGMATIS SEMINA

Calabar Bean. N.O. *Leguminosae*

Syn.—Ordeal Bean.

Habitat.—Western Africa.

Source.—The ripe seeds of *Physostigma venenosum*.

Characters.—Large, reddish-brown, oblong-reniform; 1 in. long, $\frac{3}{4}$ in. broad, $\frac{1}{2}$ in. thick, with a broad black furrow extending the entire length of the curved margin. Testa hard, thick, rough, enclosing two starchy cotyledons, between which there is a cavity. No odour. No taste.

Identification.—Easily identified, no other drug in the B.P. resembles them. Student should also note colour, size, and the black furrow.

Composition.—(1) *Physostigmine* or *Eserine* is the chief constituent. This is associated with small quantities of *Eseridine* and *Eseramine*.

Action.—Antispasmodic, myotic, and expectorant.

OFFICIAL PREPARATION

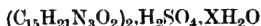
1. **Extractum Physostigmatis.**—A dark brown firm extract. **B.P. Dose.**— $\frac{1}{2}$ to 1 gr. in pill.

NON-OFFICIAL PREPARATION

1. **Tinctura Physostigmatis, B.P.C.**—Calabar bean 1, Alcohol (90 p.c.) 5.
Dose.—5 to 15 ms.

PHYSOSTIGMINÆ SULPHAS

Physostigmine Sulphate



Syn. B.P.—Eserine Sulphate.

Source.—The sulphate of an alkaloid obtained from calabar bean.

Characters.—Yellowish-white, minute crystals, becoming red by light and air; deliquescent; taste bitter. **Solubility.**—Very soluble in water and alcohol.

B.P. Dose.— $\frac{1}{10}$ to $\frac{1}{2}$ gr.

OFFICIAL PREPARATION

1. **Lamellæ Physostigminæ.**—Contains $\frac{1}{1000}$ gr. of physostigmine sulphate in each. Used to contract the pupil.

NON-OFFICIAL PREPARATIONS

1. **Guttæ Physostigminæ et Cocainæ, B.P.C.**—Physostig. Sulph. .25 p.c. and Cocaine Hydrochloride 1 p.c.
 2. **Injectio Physostigminæ Sulph. Hypodermica.**—4 grs. to 1 oz. *Dose.*—1 to 4 ms.
 3. **Hypodermic Tablets.**— $\frac{1}{1000}$ gr. in each.
 4. **Physostigminæ Hydrobromidum.**—In fibrous masses, soluble in water. *Dose.*— $\frac{1}{10}$ to $\frac{1}{2}$ gr.
 5. **Physostigminæ Salicylas, B.P.C.** *Syn.*—*Eserine Salicylate.*—In colourless, shining, acicular crystals, soluble 1 in 1 of water, which becomes red after a few days. *Dose.*— $\frac{1}{10}$ to $\frac{1}{2}$ gr.

PHARMACOLOGY

Externally.—Only used in ophthalmic practice.

Eye.—Applied locally to the conjunctiva, physostigmine is absorbed and produces the following changes—(1) **contraction of the pupil**; (2) **spasm of accommodation**, preceded briefly by an increased accommodation for near objects; and (3) **diminished intra-ocular tension**. All these actions are due to the *direct stimulation of the circular fibres of the iris and ciliary muscles*, but not to the paralysis of the sympathetic, as is shown by the following observations:—

1. The pupil contracted by physostigmine will dilate if suddenly shaded, or if the cervical sympathetic is stimulated.

2. The contraction produced by physostigmine is much greater than that caused by section of the sympathetic.

It follows therefore that the myosis is not due to paralysis of the

sympathetic, but to stimulation either of the oculo-motor nerve-endings or the sphincter itself. *The following considerations show that it is the sphincter itself that is concerned :—*

1. The pupil dilated by atropine can be made to contract with physostigmine.

2. Atropine paralyses the nerve-endings but not the muscle itself. Physostigmine can therefore only act on the latter.

3. Myotic poisons which act only on the nerve-endings (as pilocarpine, muscarine, &c.) do not counteract the mydriasis caused by atropine.

Internally. Mouth.—Physostigmine **increases the salivary secretion** by directly stimulating the salivary cells (*see* page 122). This increased salivation is not checked by atropine, but it stops as soon as the contraction of the blood-vessels begins, which no doubt reduces the circulation in the glands.

Stomach and intestines.—Physostigmine is readily absorbed by the stomach. Small doses produce colic, retching, or vomiting, and large doses diarrhoea. This is caused by the increased and irregular peristalsis, from the direct stimulation of the involuntary muscular coats, which become strongly contracted and anæmic.

Heart and circulation.—Physostigmine enters the blood unchanged. In small doses it increases the **contractile force** of the heart, while in toxic doses it **arrests it in diastole**, due to first stimulation and subsequent depression of the cardiac centre. In the same way excitability of the peripheral terminations of the vagus in the heart is increased. In large doses opposite results are observed, whereby **slowing of the heart's beats** occurs. Thus on the whole, the **pulse beats forcibly but slowly**.

The blood-pressure too rises from the increased contractile force of the heart, aided partly by, (a) the contraction of the arteries, and partly by, (b) the tetanic contraction of the intestinal tract.

Respiration.—This is at first **quickened** but soon **depressed**. Death happens from asphyxia. The acceleration is caused (1) by the paralysis of the respiratory centre of both the medulla and the cord, (2) by the stimulation of the peripheral terminations of the vagus in the lungs, and by (3) the spasmodic contraction of the bronchial tubes.

Brain.—Consciousness is not affected even by toxic doses, and the mind remains clear to the last. The **pupils may be contracted** but not, as a rule, to any great extent.

Medulla.—The respiratory and cardiac centres are affected.

Spinal cord.—Physostigmine produces most characteristic symptoms here. It markedly **depresses the anterior cornua** of the cord, thereby **abolishing reflex excitability** and producing **motor paralysis**. There may be a slight increase of reflex excitability in the beginning. The **posterior cornua** of the cord

are affected to a less extent later on, and consequently there is some loss of sensation.

Muscles.—Marked fibrillar contractions of the skeletal muscles are often seen after death. This is due to their direct stimulation by the poison, for it takes place also when the nerve-centres have been paralysed by chloral, or the motor nerves by curare, or when the nerves have been divided. The sensory nerves remain unaffected. The involuntary muscles of almost every organ, such as the stomach, intestines, bladder, heart, arteries, spleen, uterus, iris, &c., are more or less stimulated. Physostigmine acts directly upon the muscle-substance and not upon the nerve-endings.

Secretions.—Not only saliva, but sweat, tears and buccal mucus are also increased; this is due to direct stimulation of the glandular protoplasm.

Elimination.—Physostigmine is excreted by the liver and salivary glands, not by the kidneys.

Antagonists.—Atropine, chloral, strychnine, and morphine.

Antidotes.—Poisoning by calabar bean is rare. Emetics or pump-tannin. Atropine $\frac{1}{6}$ gr., hypodermically till the pupils dilate well. Chloral and strychnine are also used; artificial respiration overcomes respiratory trouble.

THERAPEUTICS

Externally. **Eye.**—Eserine is chiefly used in **ophthalmic practice**. Guttæ or lamellæ physostigminæ may be used (1) to contract the pupil in photophobia, and diminish the amount of light falling on a sensitive retina; (2) to break up adhesions in iritis; (3) to prevent prolapse of the iris after corneal wounds, ulcers or perforations; (4) to reduce intra-ocular tension in glaucoma and perforating keratitis; (5) to stimulate the paralysed ciliary muscles and iris; (6) to counteract the effects of atropine; and (7) in detachment of the retina.

As a **motor paralyser** calabar bean is chiefly used in **tetanus**. Dr. Fraser who brought the drug prominently before the profession, recommends its use at the very onset. It must be boldly pushed till the physiological effects are developed, in fact a little short of poisoning. If the patient cannot swallow, it may be given by the rectum or subcutaneously. The patient should be watched. It is used with more or less benefit in many other convulsive diseases, such as **chorea**, **paralysis agitans**, **acute mania**. Though physostigmine is an antidote to strychnine, atropine and chloral, it is rarely used in **poisoning by these drugs**.

As a **stimulant to the involuntary muscles** it may be given in **constipation**, **bronchitis**, and **atony of the bladder**, but it is rarely used for this purpose.

PICRORRHIZA. *Picrorrhiza*

N.O. *Scrophulariaceæ*. (*Ind. and Col. Addendum*)

Syn. I. V.—*Kutki, Katki*, Beng., Hind. *Katulá*, Sans.

Habitat.—India and Eastern Colonies.

Source.—The dried rhizome of *Picrorrhiza Kurroa*.

Characters.—In short pieces, about $\frac{1}{4}$ in. in diameter, as thick as a goose-quill, tapering downwards, beset with prominent scars and remains of the rootlets. The large upper part is beset with dark greyish-brown scales. Taste bitter.

Composition.—(1) A bitter glucoside, *Picrorrhizin*, yielding as its decomposition product *Picrorrhizetin*. (2) Cathartic acid. (3) Gum, &c.

Action.—Stomachic and tonic.

B.P. Dose.—10 to 20 grs as a tonic; 40 to 50 grs. as an antiperiodic.

OFFICIAL PREPARATIONS

1. **Extractum Picrorrhizæ Liquidum.**—1 in 1 of alcohol (60 p.c.). **B.P. Dose.**—20 to 60 ms.

2. **Tinctura Picrorrhizæ.**—2½ ozs. to 1 pint. By maceration, alcohol 45 p.c.). **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.

PHARMACOLOGY AND THERAPEUTICS

The root is bitter, acrid and stomachic. It is often used with success by the native *Kavirajes* in all forms of **dyspepsia** and **neuroses** of the stomach and bowels. It is a popular remedy with some physicians as an antiperiodic. It acts as a gentle cathartic either when given alone in large doses, or in small doses combined with other purgatives. As a remedy for **bilious fever** *kutki* is often combined with various aromatics and *neem bark*. In the form of a strong decoction, the bark may be prescribed with advantage for dropsies.

PICROTOXINUM. *Picrotoxin*

N.O. *Menispermaceæ*

Syn.—*Cocculin*, B.P.C.

Habitat.—Southern and Eastern India and Burma.

Source.—A neutral principle obtained from the fruits of *Anamirta cocculata* (*Cocculus Indicus*). The fruits are known in Britain as Indian berries or fish-berries, and in India as *Kákmári Kákphala*.

Characters.—Colourless and inodorous crystals; taste bitter. *Solubility.*—1 in 330 of water and 1 in 13½ of alcohol (90 p.c.). The commercial picrotoxin is not of constant composition. It is stated to contain *Picrotin* 1 p.c. and *Picrotoxinin* 66 p.c.

Action.—Parasiticide, anhydrotic.

B.P. Dose.— $\frac{1}{10}$ to $\frac{1}{2}$ gr. in pill, solution, or hypodermically. *Max. dose.*— $\frac{1}{10}$ gr. daily.

NON-OFFICIAL PREPARATIONS

1. **Liq. Picotoxini Aceticus.**—Picotoxin 1, Glacial Acetic Acid 30. Dissolve and add Distilled Water to 250, filter. Keeps well and is palatable. *Dose.*—2 to 12 ms.

2. **Ungt. Cocculi, P.L. Syn.—Kákmári Ointment.**—Powdered seeds, 80 grs., Prepared Lard 1 oz. Mix.

3. **Lamelles Picotoxini.**—Each contains $\frac{1}{10}$ gr. for hypodermic injections.

PHARMACOLOGY

Picotoxin is a powerful poison.

Externally.—It kills low forms of vegetable and animal life, and is therefore **parasiticide**.

Internally.—It stimulates the **respiratory and vagal centres** in the medulla, and the **motor centres** in the cerebrum and cord, thus causing periodic stoppage of diaphragmatic movement, slowing of the pulse, and spasms of the flexors (epileptiform convulsions). Temperature rises somewhat.

Antagonists.—Chloral hydrate ($\frac{1}{10}$ gr. of picotoxin is equal to 30 grs. of chloral).

THERAPEUTICS

The bitter fruits are used to poison crows and fish, and as a substitute for hops in beer.

Externally.—Picotoxin ointment (8 grs. to 1 oz.) or *kákmári ointment* is chiefly used to destroy **pediculi** and sometimes **tinea capitis**, but it must be applied with caution, lest it be absorbed from the denuded surface and cause poisoning.

Internally.—Picotoxin is very effective in **checking night sweats of phthisis**, but we cannot say how it acts. It has been used in **epilepsy, paralysis of the muscles of the pharynx** and **sick headache**, without much success. It is an antidote to morphine and chloroform asphyxia.

PILOCARPINE. See Jaborandi, page 474

PIMENTA. Pimento

N.O. *Myrtaceæ*

Habitat.—West India.

Source.—The dried full-grown unripe fruit of *Pimenta officinalis*, the allspice tree.

Characters.—Dark reddish-brown, globular, two-celled fruits, $\frac{1}{4}$ in. to $\frac{1}{2}$ in. in diameter. Pericarp rough, crowned by the remains of a four-toothed calyx, like a raised ring. Each cell contains a single brownish-black seed. Odour and taste like cloves.

Resembles.—Pepper which has no calyx; cubebs which is stalked.

Composition.—(1) Volatile oil (off.), chemically identical with the oil of cloves.

Action.—Aromatic, stimulant and carminative. *Dose.*—10 to 30 grs.

OFFICIAL PREPARATION

1. **Aqua Pimentæ.**—8 ozs. to 1 gallon. 1 in 20. Carminative. *Dose.*—1 to 2 ozs.

OLEUM PIMENTÆ. Oil of Pimento

Syn.—Allspice Oil.

Source.—The oil distilled from Pimento.

Character.—Yellow or yellowish-red, gradually becoming darker. Sp. gr. 1.040.

Composition.—(1) *Eugenol* 70 p.c. (2) A Sesquiterpene.

B.P. Dose.— $\frac{1}{2}$ to 3 *ms.* On sugar, pill, or emulsion.

PHARMACOLOGY AND THERAPEUTICS

The actions and uses of pimento and its oil are identical with those of cloves and of oil of cloves.

PINI OLEUM

Oil of Pine. N.O. *Coniferæ*

Syn.—Pinol, Pumiline.

Habitat.—Mountains of Central Europe.

Source.—The oil distilled from the fresh leaves of *Pinus pumilio*.

Characters.—Colourless or nearly so. Odour pleasant, aromatic. Taste pungent. Sp. gr. 0.865 to 0.870.

Composition.—Similar to that of the oil of turpentine.

Action.—Stimulant and disinfectant expectorant. *Dose.*— $\frac{1}{2}$ to 3 *ms.*

NON-OFFICIAL PREPARATIONS

1. **Syrupus Pini, B.P.C.**—Pine Oil 2.50, Tinct. Saffron 3.125, Alcohol 90 p.c.) 25, Glycerin 25, Tale or Kaolin *q.s.*, and make up to 100 with syrup. *Dose.*—1 dr.

2. **Linctus Pini, Terpin, et Acetomorphinæ, B.P.C.**—Contains Heroin hydrochlor. $\frac{3}{16}$ gr. and Terpene Hydrate $\frac{1}{8}$ gr. to each drachm. *Dose.*—to 1 dr.

3. **Hartman's Wood Wool.**—Finely comminuted pine wood, impregnated with sublimate. Used for dressings, vaccination pads, "towelettes," &c.

PHARMACOLOGY AND THERAPEUTICS

Externally.—The action of the oil of pine resembles that of oil of turpentine, except that its smell is more pleasant. When rubbed into the skin, it acts as a local stimulant and rubefacient, and is used in chronic rheumatism, lumbago, &c. Its vapour is a mild stimulant, antispasmodic, and disinfectant to the respiratory passages, and is serviceable in bronchitis, phthisis and emphysema. It may be inhaled from a handkerchief, or better through an inhaler. Vapor Olei Pini, B.P.C., can be made by triturating oil 10 with iij. Carb. Leviss. 5, and adding water to 100. Of this 1 dr. is put into an inhaler containing $\frac{1}{2}$ pint of cold and $\frac{1}{2}$ pint of boiling water.

Internally.—Given internally, it is excreted by the bronchial mucous membrane, stimulating and disinfecting its secretion, and is therefore useful in **bronchitis** and chronic wasting lung diseases. It may be taken on **sugar** or in the form of a **jube**.

PIPER NIGRUM. Black Pepper

N.O. *Piperaceæ*

Syn. I. V.—*Gol marich, kâlâ marich*, Beng. *Gol. marich*, Hind.

Habitat.—East Indies, such as Java, Sumatra, Malay Peninsula, and Malabar, Travancore where the plant is perennial.

Source.—The dried unripe fruit of *Piper nigrum*.

Characters.—Black, globular, inferior, one-celled fruits, $\frac{1}{2}$ in. in diameter. Pericarp deeply and reticulately wrinkled, containing one seed. Odour aromatic. Taste pungent. **Impurities.**—Berries of *Embelia ribes* (*Biranga*).

Resembles.—*Pimento*, which bears a calyx, and *cubebs*, which has a stalk.

Composition.—(1) *Piperine* resolvable into *Piperic acid* and *Piperidine*, a colourless liquid alkaloid. (2) *Oleo-resin*, yielding a *volatile oil* and *resin*.

Action.—Stimulant, carminative, and antiperiodic. **Dose.**—5 to 15 grs.

Enters into.—Pulv. Opii Co. and the

OFFICIAL PREPARATION

1. **Confectio Piperis.**—1 in 10. A black paste, resembling, and is sometimes called **Ward's Paste**. Useful in *piles*. **B.P. Dose.**—60 to 120 grs.

NON-OFFICIAL PREPARATIONS

1. **Oleo-resina Piperis, U.S.** **Dose.**— $\frac{1}{4}$ to 1 m. in pill.

2. **Piperinum, B.P.C.**—A colourless, crystalline, neutral principle, obtained from black and long pepper. Antipyretic and antiperiodic. Used in *intermittent fever, hæmorrhoids*, and *gonorrhœa*. 18 grs. daily cured *ague*. **Dose.**—2 to 8 grs. in pill.

3. **Piperonal.** **Syn.**—*Heliotropin*.—Obtained by the oxidation of piperine; in colourless crystals, with a vanilla odour. A powerful harmless antiseptic. **Dose.**—15 to 45 grs. in wafers.

4. **Piperidine Guaiacolate.**—In yellowish-white crystals, with a faint guaiacol odour. Recommended in *phthisis*. **Dose.**—5 to 30 grs.

5. **Piperidine Tartrate, B.P.C.**—White crystals soluble in water. A solvent of uric acid, in gouty deposits and uric acid gravel. **Dose.**—10 to 15 grs. **Max. Dose.**—24 grs. per day.

PHARMACOLOGY

Externally.—On account of the volatile oil it contains, it is a **rubefacient, counter-irritant** and afterwards **anodyne**.

Internally.—It is a **stimulant, stomachic and carminative** like pimento. During elimination it **stimulates** the mucous membrane of the **genito-urinary tract**, and the secretion of the kidneys. In

this respect it resembles cubebs. The unabsorbed portion of the drug, in passing over the rectum, restores the tone of the relaxed and chronically inflamed mucous membrane near the anus.

THERAPEUTICS

Externally.—Like mustard, it may be used as a domestic counter-irritant.

Internally.—Both the black and the white pepper (decorticated black pepper) are used as culinary spices, not only in India, but in other countries. In the form of a gargle or lozenge it may be used in relaxed **sore throat**. It is given in the shape of confection in **hæmorrhoids**, **ulcers of the rectum** and **anal fissure**, and in **gonorrhœa** and **gleet**.

PIX BURGUNDICA. Burgundy Pitch

N.O. *Coniferæ*

Habitat.—Germany.

Source.—The resinous exudations obtained from the stem of *Picea excelsa*, melted and strained.

Characters.—Hard, brittle, yet gradually taking the form of the vessel in which it is kept, opaque, reddish-brown; fracture clean, conchoidal. Odour aromatic, especially when heated. Taste sweet, aromatic.

Composition.—*Resinous acids* and *volatile oil*.

OFFICIAL PREPARATION

1. **Emplastrum Picis.** *Syn.*—*Poor Man's Plaster*.—1 in 2. A rubefacient and stimulant plaster.

PHARMACOLOGY AND THERAPEUTICS

Externally.—It is used as a basis for plasters. Being a **mild stimulant to the skin**, it is used in **lumbago** and **chronic joint affections**.

PIX CARBONIS PRÆPARATA

Prepared Coal Tar

Syn. I. V.—*Alkátrá*, Beng.

Source.—Prepared by placing commercial coal tar in a shallow vessel and maintaining it at 120° F. for one hour, stirring constantly.

Composition.—(1) *Benzene* and homologous hydrocarbons. (2) *Phenols*. (3) *Naphthalene*, *anthracene*, &c.

OFFICIAL PREPARATION

1. **Liquor Picis Carbonis.**—1 in 6. Is the official imitation of **Liquor Carbonis Detergens**, which is an alcoholic solution of common coal tar.

NON-OFFICIAL PREPARATIONS

1. **Creolin.** *Syn. Commercial.*—*Liquor Antisepticus.*—A speciality prepared from coal tar, of a dark colour. Recommended as an antiseptic. Valuable application in skin diseases, as *eczema*, *psoriasis*, &c. Serves as a substitute for carbolic acid in gynaecology. *Dose.*—1 to 5 grs. in *phthisis*, *gonorrhœa*, &c., and as an intestinal antiseptic in *enteritis*.

2. **Chinosol.**—The potassium salt of a compound of oxychinoline and sulphuric acid, in yellow minutely crystalline powder, readily soluble in water. Used as a surgical antiseptic; 15 grains to the pint equals 1 in 40 of carbolic acid. Should not be used for the sterilization of instruments, as it is apt to stain them badly. *Dose.*—1 to 5 grs.

3. **Izal** (Medical).—A proprietary name. A white emulsion of oxidized hydrocarbons, containing 40 p.c. of "Coke Oven Oil." A non-poisonous antiseptic and disinfectant. A $\frac{1}{2}$ p.c. solution is very popular in obstetrical practice. Izal has also been used with benefit in the treatment of *dysentery*. *Dose.*—15 to 60 ms.

4. **Lysol.**—A German speciality. A dark-coloured liquid, obtained by the saponification of cresols, and containing the higher homologues of phenol. Soluble in all proportions in water, and much less poisonous than phenol. A 2 p.c. solution is much used in surgery and gynaecological practice. It does not affect instruments, but, being a soapy fluid, it may make them difficult to hold.

5. **Cyllin.**—Contains 60 p.c. of a new analogue of phenol, neither caustic nor toxic. Forms a white emulsion with water. An ointment (5 p.c.) with lanoline useful in *eczema* and *scabies*. A good deodorizing disinfectant, said to be from 10 to 30 times as strong as carbolic acid. Hartigan strongly recommends the use of cyllin in *psoriasis*. The dose is 3 ms. put up in gelatin capsules, one to be given every second hour until 8 have been taken. This number may rapidly be reduced to 2 or 3 a day.

6. **Kelvolin.**—A similar preparation, containing 40 p.c. of phenol homologues.

PHARMACOLOGY AND THERAPEUTICS

The actions and uses of prepared coal tar are identical with those of wood tar (*q.v.*), except that the former is scarcely used internally. Liqr. Carb. Detergens is the best known remedy for **chronic eczema**. An ointment containing Liqr. Carb. Deter. $\frac{1}{2}$ dr., Liq. Plumbi $\frac{1}{2}$ dr., White Precipitate 15 grs., Vaseline 1 oz. is useful for the same purpose.

PIX LIQUIDA. Tar

N.O. *Coniferae*

Syn.—Wood Tar. **Syn. Commercial.**—Stockholm Tar.

Source.—A bituminous liquid obtained from the wood of *Pinus sylvestris*, and other species of *Pinus*, by destructive distillation.

Characters.—A dark brown or blackish, semi-liquid substance. Odour peculiar, aromatic. Sp. gr. 1.02 to 1.15. **Solubility.**—1 in 10 of alcohol (90 p.c.), slightly in olive and turpentine oils. *

Composition.—(1) *Creosote*. (2) *Phenol*. (3) *Oil of turpentine*. (4) *Acetic acid*. (5) *Pyrocatechin*. (6) *Toluol*. (7) *Xylol*. (8) *Acetone*. (9) *Resins*, &c.

Action.—Antiseptic expectorant. *Dose*.—2 to 10 grs. or more in pills or capsules.

OFFICIAL PREPARATION

1. **Unguentum Picis Liquidæ.** *Syn.*—*Tar Ointment*.—Black. Too hard to use. *Ung. Picis Molle* is a softer preparation.

NON-OFFICIAL PREPARATIONS

1. **Aqua Picis, B.P.C.** *Syn.*—*Tar Water*, *Eau de Goudron*.—Tar 10, Distilled Water 100. Mix and filter. *Dose*.—18 ozs. daily.

2. **Capsules of Tar.**—Contain 5 ms. in each.

3. **Pigmentum Picis Liquidæ.**—Tar 1, Alcohol (90 p.c.) 1. A stimulating application to *psoriasis* or *chronic dry eczema*.

4. **Pilula Picis Liquidæ.**—Tar 1, Liquorice Powder 2½, Soap 1, Pulv Tragacanth Co. ¼. Mix. *Dose*.—3 to 6 grs.

5. **Syrupus Picis Liquidæ, U.S., B.P.C.**—Used in *winter cough*, *phthisis*, and *chronic bronchitis*. Taste is covered by syrup of wild cherry. *Dose*.—1 to 2 drs.

6. **Ung. Picis Molle, B.P.C.**—Tar 71, Beeswax 14.50, Almond Oil (by weight) 14.50. Melt and mix.

PHARMACOLOGY

Externally.—Wood tar resembles oil of turpentine in action, but is not so powerful. As it contains creosote, phenol, oil of turpentine, &c., it is **antiseptic** and a **vascular stimulant**. When rubbed in, it sometimes causes severe inflammation, or pustules, of healthy sensitive skin, especially those parts which are hairy. It is a **sedative** to the nerves. Tar preparations, if used for any length of time, are apt to set up a very troublesome form of **acne**, called by Hebra, **tar acne**.

Internally.—It may cause indigestion, and in large doses symptoms of carboic acid poisoning (see p. 186). It is absorbed and during elimination exerts a beneficial influence on the chronically inflamed bronchial mucous membrane, **disinfecting, deodorizing and checking profuse secretion**, and promoting free **expectoration**. These effects may be obtained, according to Yeo, both when used as an inhalation or spray, and when taken internally.

THERAPEUTICS

Externally.—Tar water is a stimulating lotion for **wounds** and **sluggish ulcers**. The ointment or pigment is an excellent application for **chronic scaly skin diseases**, such as **psoriasis**. **Chronic eczema** too is benefited by it.

Internally.—As an expectorant, wood tar only is used for **chronic bronchitis, bronchiectasis** and **winter cough**. It may be given

in pills, capsules or syrup. Tar water may be given internally for the same object. Apomorphine combined with the syrup of tar and syrup of the Virginian prune makes an admirable cough linetus.

ADDITIONAL COAL TAR DERIVATIVES AND ALLIED PREPARATIONS

1. **Alypin.**—A white crystalline powder (*see* p. 355).
2. **Anthrabin, B.P.C.**—A brownish-yellow powder, obtained by reduction from *alizarin*. The ointment (1 in 8 or 10) used in *psoriasis*.
3. **Exodin.**—An *oxy-anthroquinon* derivative. A tasteless and inodorous yellow powder, insoluble in water. A safe and painless purgative, causing no gastric irritation. *Dose.*— $7\frac{1}{2}$ to 24 grs.
4. **Fluorescein.** *Syn.*—*Resorcin-phthalcin Anhydride.*—A yellowish-red crystalline powder, sparingly soluble in water, and showing an intense green fluorescence, especially in the presence of an alkali. A 2 p.c. solution with 3 p.c. of sodium bicarbonate, used for the detection of *corneal ulcers* and *abrasions* which take a green colour that persists for several hours.
N.B.—In combination with sodium it forms a brownish-red powder, known as *uranin*, which gives a similar fluorescence.
5. **Fuchsine.** *Syn.*—*Rosaniline Mono-hydrochloride, Magenta.*—Brilliant iridescent crystals, forming deep red solution with water. Used for staining *B. tuberculosis* and in the treatment of *renal albuminuria*. *Dose.*— $\frac{1}{2}$ to 4 grs. in pill with glycerin of tragacanth.
6. **Isopral.** *Syn.*—*Trichlor-isopropyl alcohol.*—A white deliquescent volatile powder, with a pleasant camphoraceous odour and sharp burning, slightly bitter taste. Fairly soluble in water and readily so in a mixture of alcohol and water. It is a *hypnotic*, resembling chloral hydrate in its action, but has no effect on the heart and circulatory system. Useful in *insomnia* and *maniacal excitement*. Said to be twice as active as chloral hydrate and less toxic.
Dose.—As a hypnotic, 10 to 15 grs.; for maniacal excitement, 20 to 45 grs. A mixture of 30 parts of isopral with 10 parts each of absolute alcohol and castor oil produces hypnotic effects after inunction. The quantity necessary may be rubbed into the axilla or the upper part of the thigh.
7. **Kyrogenin.** *Syn.*—*Meta-benzamine-semicarbazide.*—A crystalline body sparingly soluble in water, used in *pyrexia of phthisis*. *Dose.*—3 to 24 grs.
8. **Methylene Blue, B.P.C.** *Syn.*—*Tetramethyl thionine chloride.*—Dull dark green crystals, forming an intense blue solution in water. A 3 p.c. solution is a useful local application for *eczema* in children. It is allowed to dry on and then covered with a thin layer of collodion. Used as an *analgesic* in *rheumatism*, *migraine*, *sciatica*, and *neuralgia*, and as an *antiperiodic* in *malarial fevers*. Colours the urine blue. Its chief use is as a test for the permeability of the kidneys. For this purpose 1 c.c. of a 5 p.c. solution is injected into the *gluteus maximus* and then hourly

observations are taken to ascertain: (a) When the colour first appears in the urine; (b) how long the period of elimination lasts. With normal kidneys the colour first appears within 40 minutes and elimination is completed within 48 hours. If there be interstitial nephritis the first appearance of the colour is delayed and the period of elimination prolonged beyond 48 hours. *Dose*.—1 to 5 grs.

9. **Neuronal.** *Syn.*—*Bromo-diethyl acetamide*.—A crystalline substance, soluble in alcohol, sparingly soluble in water, contains 40 p.c. of bromide. A safe and good *hypnotic*, resembling veronal in its action. Especially useful in *mental excitement of epileptics*. *Dose*.—7½ to 15 grs.

10. **Orexine Tannate.**—An insoluble greyish-white powder, without taste or smell. Antipyretic, antineuralgic, assists digestion, and promotes appetite. Useful in *sea-sickness*. *Dose*.—4 to 8 grs.

11. **Resorcin, B.P.C.** *Syn.*—*Meta-dihydroxybenzene, Resorcinol*.—White crystalline plates, resembling benzoic acid, but larger. Easily volatilized. Soluble 1 in 1 of water, 2 in 1 of alcohol, and 1 in 20 of olive oil. Powerfully *antiseptic*, coagulates albumen, and has a caustic action in the skin. Solutions should not be stronger than 2 to 5 p.c. Very useful as a local application in *diphtheria*; also in the inflammatory stage of *eczema* (20 grs. resorcin to 1 oz. of zinc ointment). In the form of a spray it is used in *whooping-cough*. Internally it acts as an intestinal antiseptic and has a specific action comparable to that of quinine, but although it is very slightly toxic it must be used with great caution, as it is apt to produce profuse perspiration and its antipyretic action is of short duration. It must be administered well diluted with water and flavoured with syr. aurantii. It is incompatible with sp. atheris nitrosi. Used in *hectic fever* and in *infantile diarrhoea*, specially in combination with Benzo-naphthol. *Dose*.—1 to 5 grs.

12. **Resorcin-monacetate.** *Syn.*—*Euresol*.—A honey-like mass, available for all purposes for which resorcin is used, especially for application to those parts of the skin covered with hair.

13. **Thio-Resorcin.**—A compound of resorcin and sulphur. A yellowish powder, recommended as a *substitute for iodoform*.

14. **Stovaine.** *Syn.*—*Amylene Hydrochloride*.—A local *anæsthetic*, less toxic than cocaine (*see p. 355*).

15. **Thalline Sulphas.** *Syn.*—*Tetrahydroparamehyl Oxychinoline Sulphate*.—White granular crystals, with a nauseous pungent taste, soluble 1 in 7 of water. Has marked antipyretic properties, but is rarely used for that purpose because it is very liable to bring about destructive changes in the blood. Nine grains have been known to cause death. Is chiefly employed as a local application in *gonorrhoea* in the form of utrophores, when it may be combined with Protargol, Resorcin or Tannin.

PLUMBUM. Lead, Pb

Syn. I. V.—*Sisa, Beng. Sisa, Sans.*

The B.P. salts and preparations of lead are prepared either from (1) the Oxide or (2) the Carbonate.

PLUMBI ACETAS. Lead Acetate

Syn.—Sugar of Lead.

Source.—Obtained by dissolving lead oxide or lead carbonate in acetic acid. $\text{PbO} + 2\text{HC}_2\text{H}_3\text{O}_2 = \text{Pb}(\text{C}_2\text{H}_3\text{O}_2)_2 + \text{H}_2\text{O}$.

Characters.—Small, white, monoclinic prisms, slightly efflorescent; odour acetous; taste sweet, astringent. **Solubility.**—1 in less than 3 of water, 1 in 30 of alcohol (90 p.c.). **Impurities.**—Carbonates, chlorides, nitrates, and other metals.

Incompatibles.—Mineral and tannic acids and their salts, alkalis, lime water, chlorides, iodides, preparations of opium, mucilage of acacia, and albuminous fluids.

Action.—Sedative, astringent, hæmostatic.

B.P. Dose.—1 to 5 grs. in mixture or pill.

OFFICIAL PREPARATIONS

1. **Pilula Plumbi cum Opio.**—3 of lead and $\frac{1}{2}$ of opium in 4. Sedative, narcotic, and powerful local and general astringent. **B.P. Dose.**—2 to 4 grs.

2. **Suppositoria Plumbi Composita.**—3 grs. of lead and 1 gr. of opium in each. Astringent, anodyne in *dysentery*, and hæmostatic, without deranging the stomach.

3. **Unguentum Plumbi Acetatis.**—1 in 25. White. Local astringent and sedative in irritable skin affections, &c.

LIQUOR PLUMBI SUBACETATIS FORTIS

Strong Solution of Lead Subacetate

Syn. B.P.—Goulard's Extract.

Source.—Prepared by boiling together lead acetate, lead oxide, and water. $\text{PbO} + \text{Pb}(\text{C}_2\text{H}_3\text{O}_2)_2 = \text{Pb}_2\text{O}(\text{C}_2\text{H}_3\text{O}_2)_2$ lead subacetate.

Characters.—A clear colourless liquid, becoming turbid from exposure; taste sweet, astringent; reaction alkaline.

Action.—A powerful irritant and astringent; only used diluted.

OFFICIAL PREPARATIONS

1. **Liquor Plumbi Subacetatis Dilutus.** *Syn. B.P.*—Goulard's Lotion, Goulard Water.—2 drs. to 1 pint. A colourless liquid. Local astringent and sedative.

2. **Glycerinum Plumbi Subacetatis.**—1 in 6 (weight). Astringent and local sedative.

3. **Unguentum Glycerini Plumbi Subacetatis.**—1 in 6. White. Mild local astringent and sedative.

NON-OFFICIAL PREPARATION

1. **Cremor Lithargyri.**—Solution of lead subacetate 1, Cream 7; mix. Useful in *eczema*.

PLUMBI CARBONAS. Lead Carbonate

Syn.—White Lead. **Syn. I. V.**—*Safedá*, Beng., Hind.

Source.—Prepared by the interaction of lead, water, and carbonic anhydride in the presence of vapours of acetic acid.

Characters.—Soft, heavy, white powder. **Solubility.**—Insoluble in water, soluble in dilute acetic acid.

Action.—A mild astringent and sedative, used only externally.

OFFICIAL PREPARATION

1. **Unguentum Plumbi Carbonatis.**—1 in 10. Cream-coloured. Used for excoriated *inflamed surfaces* and *burns*.

PLUMBI IODIDUM. Lead Iodide. PbI_2

Source.—Obtained by the interaction of lead nitrate or acetate and potassium iodide.

Characters.—A heavy bright yellow powder. **Solubility.**—1 in 2000 of cold water, and 200 of boiling water.

Action.—Resolvent, antiparasitic.

OFFICIAL PREPARATIONS

1. **Emplastrum Plumbi Iodidi.**—1 in 10. Bright yellow solid. Resolvent, alterative. In *chronic enlargements of glands*.

2. **Unguentum Plumbi Iodidi.**—1 in 10. Yellow. In *ringworm* and *enlarged glands*.

PLUMBI OXIDUM. Lead Oxide. PbO

Syn. B.P.—Litharge. **Syn. I. V.**—*Mudru sung*, Beng., Hind.

Source.—Prepared by the action of air on melted lead. $\text{Pb}_2 + \text{O}_2 = 2\text{PbO}$.

Characters.—Pale, yellowish-red, heavy scales. **Solubility.**—Completely in dilute nitric and acetic acids, insoluble in water. **Impurities.**—Iron, copper, carbonates.

Enters into.—The preparation of Liq. Plumb. Fort., Plumbi Acetas, Glycerinum Plumb. Subacetatis, and the

OFFICIAL PREPARATION

1. **Emplastrum Plumbi.** **Syn.**—*Diachylon* or *Litharge Plaster*.—A pale yellow solid, being a crude oleate, palmitate, and stearate of lead. Speaking *chemically* it is *soap*. A sedative and protective application.

Enters into.—Emp. Hydrarg., Emp. Plumbi Iodidi, Emp. Resinæ, Emp. Saponis.

NON-OFFICIAL PREPARATION

1. **Ung. Diachyli, B.P.C.** *Syn.*—*Hebra's Ointment.*—Lead Plaster 50, Ol. Lavender (by weight) 1, Olive Oil (by weight) 49, melt with heat. Useful in *eczema*, excessive perspiration of feet and *sycosis*.

ACTIONS AND USES OF LEAD OXIDE

The oxide has desiccant properties but is scarcely ever used. *Emplastrum Plumbi* is the basis of most of the plasters. It serves mechanically to hold the lips of *wounds* together, to protect **irritable surfaces**, and by its pressure to help the absorption of **effused products** or indolent enlargements.

PHARMACOLOGY OF LEAD SALTS

Externally.—Lead salts have a feeble action on the unbroken skin, but on denuded and exposed mucous surfaces, wounds and ulcers, they produce the following definite effects. They (1) **precipitate the albumen of discharges**, and form an impervious coating on the surface; (2) **coagulate the albumen of the tissues** and condense them; (3) **constrict the blood-vessels** of the part, and arrest the escape of plasma and corpuscles; and (4) **depress the local nerves**, and allay itching. Thus they are local **astringents**, **antiphlogistics**, and **nervine sedatives**.

Internally. **Gastro-intestinal tract.**—Insoluble lead salts are tasteless. Soluble salts have a sharp astringent and sweetish taste. The same local actions as on the skin, occur in the mouth, stomach and intestines. Soluble salts are converted into an albuminate, partly in the mouth, and partly in the stomach and intestine, and are absorbed as such. Whatever remains unabsorbed is eliminated as a sulphide with the faeces, to which it imparts a leaden hue. In the intestines, lead salts perform three distinct functions, *viz.*—(1) they check the secretion of succus entericus, (2) constrict the arteries, and (3) arrest or retard peristalsis. They are therefore powerful **intestinal astringents** and **haemostatics**, producing constipation and arresting any hæmorrhage that may exist. They diminish the secretion of bile.

Blood.—Lead salts are supposed to enter the blood as an albuminate, chiefly by the gastro-intestinal tract and skin, but occasionally by the respiratory tract. The plasma is said to become more watery, hæmoglobin is diminished, and the red blood-corpuscles are reduced in number. Thus they induce a **sallow anæmia**.

Tissues.—Lead is freely taken up by, and remains in, the tissues of the body. The central nervous system, liver, kidneys and bones, are the principal seats of deposit. Thus being intimately connected with growing cells, it produces certain pathological effects, which are known as "*Plumbism*."

Elimination.—Lead is slowly excreted by the urine, bile, sweat, milk, and especially by the intestines. It checks **excretion of urates** and predisposes to gout.

Acute toxic action.—Concentrated solutions of lead salts are irritant. Acute poisoning is rare, but has recently not been infrequently seen on account of the use of diachylon plaster as an abortifacient. Abortion certainly follows its administration, but acute plumbism leading to paralysis, blindness, insanity, and death also sometimes occur. Burning pain in the stomach, dryness of the throat, thirst, vomiting, colic, constipation with slate-coloured stools, cold sweats, cramps in the legs, collapse; sometimes even stupor, coma, and convulsions are some of the symptoms induced by the acetate.

Antidotes.—Stomach-pump, zinc sulphate, both as an emetic and antidote, followed by milk or the white of egg; dilute sulphuric acid. Sodium and magnesium sulphates are chemical antidotes, for they produce insoluble sulphates and open the bowels. Morphine or demulcent drinks to relieve colicky pain.

Chronic toxic action or "**Plumbism.**"—Chronic poisoning by lead is very common and originates from the slow absorption and retention of minute quantities of the drug. Lead is therefore a **cumulative poison**. Workers in lead factories, and those who constantly handle lead are very prone to poisoning, for they generally contaminate their food by their unwashed hands. Some wines, cosmetics, hair-dyes, snuff packed in lead-foil, and drinking-water stored in lead cisterns and pipes are also sources of danger.

The **symptoms** are characteristic. Besides impaired digestion, constipation, a sweetish taste in the mouth and intestinal colic, the formation of a **blue line** on the edge of the gums, most marked near the incisors, are the early symptoms. It is due to the deposit of the sulphide, the sulphur being obtained from the food and the tartar of the teeth. For the same reason a blue line may be noticed round the anus. **Severe cramps** in the calves of the legs next appear, followed by **paralysis of the extensors of the forearm**, leading to **wrist-drop**. The latter symptom is due to chronic peripheral neuritis of the motor nerves supplying these muscles. The affected muscles become the seat of fatty degeneration, but it is to be noted that the supinator longus usually escapes. The paralysis may extend to other muscles, and there may be general paraplegia or homioplegia. Occasionally the anterior cornua of the spinal cord waste. The sensory fibres are not often affected, hence pain or numbness is rare.

Saturnine lunacy and **saturnine epilepsy** may arise as the result of the action of the poison upon the nervous centres. Also **optic neuritis** and **blindness**. As lead prevents the **excretion of urates** from the blood, gouty inflammation of joints often ensues, and especially so in patients with a gouty diathesis. Chronic lead poisoning is also a very common cause of **granular kidney**, but we do not know whether this is due to the irritation caused by the lead salts, or to the gouty conditions produced by them. **Abortion** is a frequent complication, and for this reason diachylon plaster is often administered with criminal intent.

Treatment.—Avoidance of the poison. Alum and belladonna to relieve pain and constipation. Potassium iodide to dissolve insoluble compounds

and magnesium sulphate to remove them from the system, and prevent their re-absorption after they have been eliminated into the intestines. Morphine subcutaneously for colic, sulphur baths to help elimination by the skin, electricity and friction to paralysed muscles.

Lemonade, made with acid. sulph. dil. instead of tartaric or citric acids, a milk diet, and strict personal cleanliness are the best methods of prophylaxis.

THERAPEUTICS OF LEAD SALTS

Externally.—The uses of many of the preparations of lead have been briefly alluded to under their respective heads. Generally speaking, lead salts are useful in a variety of diseases:—(1) To *soothe irritation and control excessive discharge*, the lotions and ointments are employed in inflamed painful weeping **eczema**, irritable **ulcers** and **wounds**.¹ The injection may be used with benefit in **vulvitis**, **leucorrhœa**, **gonorrhœa**, **gleet**, **otorrhœa**, &c. A lead and opium lotion (Ext. opii. 5 grs., Liq. Plumb. subacet. dil. 1 dr., and water to 1 oz.) is a good sedative and antiphlogistic application to **bruises**, **sprains** and other **cutaneous inflammations** such as **erysipelas**, &c. Diachylon ointment, alone or combined with zinc oleate or mercuric oleate ointments, makes a very effective non-irritant application. Lead collyria should never be used in **ulcerated cornea**, as a deposit of white lead may form, causing permanent opacity and blindness. (2) To *allay irritation and itching*, a lotion or ointment is used in **pruritus pudendi** (the cause being first removed), **urticaria**, &c. (3) To *promote absorption* of morbid products, mechanically or otherwise, lead plasters are applied to **indolent glandular enlargements** and **swollen joints**. (4) To *arrest local hæmorrhages*, lead salts are never used. (5) As a *parasiticide*, iodide of lead ointment is used in **ringworm**.

Internally.—For its local astringent effects, Glycerinum Plumbi Subacetatis, or gargle can be used in **tonsillitis**, **pharyngitis**, &c. Lead acetate is the only salt that is used internally. Its chief use is to check severe **diarrhœa** and **hæmorrhage** from stomach and bowels as in **typhoid fever** and **tuberculosis**. Pilula Plumbi c. Opio is a very valuable preparation in such cases. Lead suppository or an enema of acetate of lead may be employed to arrest **rectal hæmorrhages** and as an **astringent** in **chronic dysentery**. It is doubtful whether lead has any effect in **hæmoptysis**, though many physicians still prescribe it for this purpose, in combination with morphine.

PODOPHYLLI RHIZOMA

Podophyllum Rhizome. N.O. *Berberidaceæ*

Syn. B.P.—Podophyllum Root.

Habitat.—North America.

Source.—The dried rhizome and roots of *Podophyllum peltatum*. American May Apple or Mandrake.

Characters.—Dark, reddish-brown, smooth, or slightly wrinkled cylindrical pieces; several inches long, $\frac{1}{2}$ to $\frac{3}{4}$ in. thick; presenting at intervals enlargements, which are marked on the upper surface by a depressed circular scar, and on the under surface stout, brittle rootlets, or their scars. Fracture short. Internally white, starch-like, or pale, yellowish-brown and horny. Odour characteristic. Taste bitter, acrid.

Composition.—Resin is the chief ingredient. It is composed of (1) *ether soluble* and (2) *alcohol soluble* resins, which contain an active purgative crystalline body. (3) *Podophyllotoxin*, which again splits up into (a) *Picro-podophyllic acid*, an inert body and (b) *Picro-podophyllin*, a crystalline-neutral substance, the active principle.

Action.—Cholagogue and hydragogue purgative. **Dose.**—3 to 10 grs.

OFFICIAL PREPARATIONS

1. **Podophylli Resina.** *Syn.*—*Podophyllin, Vegetable Calomel.*—A pale yellow to orange-brown amorphous powder, prepared by extracting the root with alcohol (90 p.c.), and precipitating the resin with water; soluble in alcohol and ammonia. *Incompatibles.*—Water precipitates it from the alcoholic solution, and acids from the ammoniacal solution. **B.P. Dose.**— $\frac{1}{2}$ to 1 gr.
2. **Tinctura Podophylli.**—2 grs. of resin in 1 dr. **B.P. Dose.**—5 to 15 ms.

NON-OFFICIAL PREPARATIONS

1. **Podophyllotoxin.**—More certain in action and said not to cause constipation as an after effect. **Dose.**— $\frac{1}{10}$ to $\frac{1}{4}$ gr. for an adult; $\frac{1}{40}$ to $\frac{1}{10}$ gr. to children. 1 gr. dissolved in 2 drs. of alcohol (90 p.c.) best given in syrup or on sugar in 2 to 10 drop doses.
2. **Tinctura Podophylli Ammoniata, B.P.C.**—Podophyllum resin 1, Sp. Ammon. aromatic. 50; dissolve and decant. Water does not precipitate the resin, which is a distinct advantage. A powerful hepatic stimulant and purgative. **Dose.**—10 to 20 ms. as a purgative.
3. **Chologen Tablets.**—Said to contain mercury and podophyllin. In *cholclithiasis*.
4. **Pilula Aloini et Podophylli Co. B.P.C.**—Podophyllin $\frac{3}{10}$ gr., Jalap Resin $\frac{1}{10}$ gr., Aloin $\frac{1}{10}$ gr., Oleo-resin (capsici) $\frac{1}{10}$ gr., Ext. Nucis Vom. $\frac{1}{10}$ gr., Ext. Hyoscyam. $\frac{1}{10}$ gr. Mix, and divide into pills $\frac{1}{2}$ gr. each. **Dose.**—1 to 4 pills.

PHARMACOLOGY

Externally.—The resin acts as an irritant to the unbroken skin. The dust coming in contact with the eyes causes conjunctivitis. It is absorbed by raw surfaces and produces its specific effect, *i.e.* purgation.

Internally. Gastro-intestinal tract.—Being bitter and acrid in taste, podophyllin may excite salivation. In purgative doses it causes griping, perhaps nausea, and within 10 to 12 hours a free watery stool. The purgative virtue is due to (1) the **increased secretion** from the intestinal glands, (2) the **increased peristalsis**, and (3) the **increased flow of bile**. Much of the force of the drug is directed to the small intestine, more specially the duodenum whose contents

it sweeps along rapidly, in which respect it resembles calomel. Hence it has received the name of "vegetable calomel." Beyond this it has none of the other properties of calomel. Impure resin produces more griping, and common salt increases its cathartic effect. Therefore, it is a powerful hydragogue purgative. In large doses it gives rise to **gastro-intestinal irritation**, and sometimes causes death. Bile dissolves the drug. As a purgative its action varies with different individuals. Some are more susceptible than others.

Liver.—In *small doses* it is a powerful **hepatic stimulant**, increasing the amount and solids of the bile. In doses sufficient to act as a purgative, although the bile flows more freely from the gall-bladder to the duodenum, the drug is swept rapidly down the canal, without giving it time to be absorbed, consequently the biliary secretion is less stimulated than it would be by smaller doses. The old view was that it increases both *secretion* and *excretion* of bile and that it was therefore both a **direct** and **indirect cholagogue**, but this has lately been disputed.

Absorption.—It is absorbed by raw surfaces, mucous and serous membranes and cellular tissue. It produces its specific effects even when injected into the veins.

THERAPEUTICS

Internally.—As a **purgative** it is an excellent remedy for **constipation**, due to hepatic disorder or otherwise; the griping being corrected by Hyoscyamus, Belladonna, or Cannabis Indica. Its action becomes more uniform and certain, when combined with other purgatives, e.g. aloes, jalap, colocynth, rhubarb. Calomel and podophyllin make a very advantageous combination, as they aid each other's actions on the same portion of the intestine. Being a **cholagogue** as well, it is best suited for **constipation** caused by the **torpid condition of the liver, biliousness** or **hepatic dyspepsia**. $\frac{1}{4}$ to $\frac{1}{2}$ gr. can be recommended as an ordinary dose for habitual constipation, but $\frac{1}{4}$ to $\frac{1}{2}$ gr. should be given in **obstinate constipation** or to relieve **portal congestion**. Sometimes larger doses are necessary. Ringer considers it an efficacious remedy for **infantile constipation**, with hard, lumpy, clay-coloured stools. 1 gr. resin may be dissolved in 1 dr. of alcohol (90 p.c.), and of this 1 or 2 drops on a lump of sugar or with honey, 2 or 3 times a day. Whey, sherbet or mucilaginous drinks stop excessive purging.

As a pure **hepatic stimulant** it must be given in non-purgative doses ($\frac{1}{30}$ to $\frac{1}{10}$ gr.), in many **functional disorders of the liver**, characterized by metallic taste in the mouth, dull depressed spirits, sluggish bowels, sick-headache, &c. According to Ringer small doses are highly useful in some forms of **chronic diarrhoea** marked by highly-coloured motions and cutting pains, or by pale, watery, frothy motions with severe griping; and in **diarrhoea** occurring in the morning and ceasing in the day, only to return next morning. In

such cases one or two drops of the alcoholic solution may be given 3 or 4 times a day.

Prescribing hints.—One of the best ways of giving podophyllum is to dissolve it in Sp. Ammon. Aromat. (1 gr. to 1 dr.), as the resin then remains in solution on the addition of water and is not precipitated as it is if you use the B.P. tincture.

Pill for habitual constipation and torpid liver.—Podophyll. Res. $\frac{1}{2}$ gr., Pulv. Ipecac. $\frac{1}{2}$ gr., Ext. Euonym. sic. 1 gr., Ext. Nucis Vom. $\frac{1}{2}$ gr., Ext. Hyoscyamus $\frac{1}{2}$ gr., Pil. Rhei Co. 2 grs., M. ft. Pil. Mitte tales xii. Twice daily after breakfast and dinner.

PODOPHYLLI INDICI RHIZOMA

Indian Podophyllum

(Ind. and Col. Addendum)

Habitat.—India and Eastern Colonies.

Source.—The dried rhizome and roots of *Podophyllum emodi*.

Characters.—Horizontal, more or less cylindrical and contorted, $\frac{1}{2}$ to $\frac{1}{2}$ in. thick, crowded above with tuberosities, marked by depressed scars; giving off numerous simple rootlets from the under surface. Earthy brown. Faint odour, bitter taste.

Composition.—Indian Podophyllum contains double the amount of resin yielded by *Podophyllum peltatum*, but the resin contains only half the quantity of crystalline *picropodophyllin* to which the value as a cathartic is due.

OFFICIAL PREPARATIONS

1. **Podophylli Indici Resina.**—A powdered resin obtained from *Podophyllum rhizome* and resembling Pod. resin. **B.P. Dose.**— $\frac{1}{4}$ to 1 gr.
2. **Tinctura Podophylli Indici.**—Ind. Podophyllum resin 1, Alcohol (90 p.c.) 3. **B.P. Dose.**—5 to 15 ms.

PHARMACOLOGY AND THERAPEUTICS

Precisely as the other variety (see p. 569). The resin, however, is not quite so powerful as a purgative and it does not answer to the B.P. tests. It *gelatinizes* with a solution of ammonia, and cannot therefore be administered dissolved in Sp. Ammon. Aromatic.

POTASSIUM. Potassium. K

POTASSA CAUSTICA. Potassium Hydroxide

KOH

Syn. B.P.—Caustic Potash, Potassium Hydrate, Hydrate of Potassium B.P. 1885.

Source.—Prepared by the interaction of potassium carbonate and calcium hydroxide. $K_2CO_3 + Ca(OH)_2 = 2KHO + CaCO_3$.

Characters.—Deliquescent, corrosive, alkaline, white pencils or cakes.
Solubility.—2 in 1 of water and 1 in 2 of alcohol (90 p.c.). **Impurities.**—Lead, copper, arsenium chloride. Should not contain more than 10 p.c. of combined water and impurities.

Action.—Powerful caustic.

Enters into.—The preparation of Pot. Bromid., Pot. Iodid., Pot. Permanganas, and the

OFFICIAL PREPARATION

1. **Liquor Potassæ.**—27 grs. Caustic Potash in 1 oz. A colourless, odourless, transparent, alkaline liquid, with sp. gr. 1.058. **Impurities.**—Carbonates, sulphates, chlorides, and other metals.

Dispensing hint.—To be kept in green glass bottles with air-tight stoppers.

Action.—Antacid.

B.P. Dose.—10 to 30 *ma.* well diluted.

NON-OFFICIAL PREPARATION

1. **Pasta Potassæ cum Calce, B.P.C.** *Syn.*—*Vienna Paste.*—Caustic Potash and Quicklime in equal weights. Add alcohol *q.s.* to form a paste.

PHARMACOLOGY

Externally.—Caustic potash or a concentrated solution of potash has a strong affinity for water, and dissolves albumen. It therefore rapidly destroys tissues with which it comes in contact, producing a greyish eschar. Hence, it is a powerful **irritant** and **caustic**. A less concentrated solution is irritant, softening and dissolving the epidermis. Still more diluted, it (1) roddens the skin, (2) neutralizes acids, and (3) dissolves greasy substances. It is therefore a **rubefacient**, **antacid** and **detergent**. A *hot weak* solution is a **sedative**.

Internally.—Liquor potassæ acts in the same way as the potassium carbonates, but it has more irritant and less diuretic action.

THERAPEUTICS

Externally.—Caustic potash in the form of the solid stick is occasionally applied to destroy **lupus** and **epithelial cancers**. As it diffuses rapidly, care should be taken to protect the surrounding and deeper tissues, by applying blotting-paper to absorb the moisture, or covering the part with two or three pieces of plaster, and applying the caustic through a hole in the centre. The hole should be *smaller* than the eschar which it is intended to produce. Acetic acid or vinegar diluted, should be applied to neutralize the caustic when further action is no longer required. The severity of its action can be better controlled by the use of *Vienna paste*, which is more manageable than the undiluted caustic potash.

A pellet of cotton-wool soaked in liquor potassæ firmly applied over an ingrowing toe-nail, so far softens it as to admit of its being easily scraped or peeled off without pain. Weaker lotions are used

to partially dissolve and facilitate the removal of scales in **psoriasis**, and to allay the **itching** of **urticaria** and **eczema**. A weak hot lotion may be employed locally as a fomentation or bath to relieve the pains of **gout** and **rheumatism**. Soft or potash soaps are good cleansing agents.

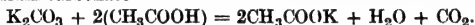
Internally.—As an antacid, it is occasionally serviceable in **irritative acid dyspepsia**, but as an alkalizer of blood and urine, the bicarbonate, citrate and acetate are to be preferred, as they are less irritant to the stomach. It is given to **absorb fat** in **obesity**, but serious consequences may follow from excessive use of alkalies or their carbonates, as they cause derangement of digestion and lessen the total amount of the solids of the blood. They also undoubtedly increase the oxidation of both fats and proteids. You should therefore always advise your patients to avoid the various quack nostrums which are extensively advertised as cures for corpulence.

POTASSA SULPHURATA See Sulphur

POTASSII ACETAS. Potassium Acetate



Source.—Prepared by fusing the product of the interaction of acetic acid and potassium carbonate



Characters.—White foliaceous, satiny masses, or granular particles, deliquescent, alkaline. *Solubility.*—2 in 1 of water, 1 in 2 of alcohol (90 p.c.). *Impurities.*—Carbonates, sulphides, and metallic impurities.

Action.—Diuretic and lithontriptic.

B.P. Dose.—10 to 60 grs.

POTASSII CITRAS. Potassium Citrate



Source.—Prepared by the interaction of citric acid and potassium carbonate. $3\text{K}_2\text{CO}_3 + 2\text{H}_3\text{C}_6\text{H}_5\text{O}_7 = 2\text{K}_3\text{C}_6\text{H}_5\text{O}_7 + 3\text{H}_2\text{O} + 3\text{CO}_2.$

Characters.—White deliquescent powder. Taste saline, feebly acid. *Solubility.*—Freely in water.

Action.—Antacid, diaphoretic, and diuretic.

B.P. Dose.—10 to 40 grs.

POTASSII TARTRAS. Potassium Tartrate



Source.—Prepared by neutralizing acid potassium tartrate with potassium carbonate. $2\text{KHC}_4\text{H}_4\text{O}_6 + \text{K}_2\text{CO}_3 = 2\text{K}_2\text{C}_4\text{H}_4\text{O}_6 + \text{H}_2\text{O} + \text{CO}_2.$

Characters.—Small, colourless, 4 or 6 sided prisms. Neutral in reaction.

Solubility.—1 in 1 of water. *Impurities.*—Acid tartrate, metals.

Action.—Diuretic, cathartic.

B.P. Dose.—30 to 60 grs. as a diuretic ; 2 to 4 drs. as a purgative.

POTASSII TARTRAS ACIDUS

Acid Potassium Tartrate

$(\text{CHOH})_2\text{COOH.COOK}$

Syn. B.P.—Bitartrate of Potassium, Purified Cream of Tartar.

Source.—Prepared from the crude cream of tartar which is deposited during the fermentation of grape juice and from the lees of wine.

Characters.—A gritty white powder, or fragments of crystallized cakes. Taste acid. *Solubility.*—1 in 200 of cold water, not in alcohol. *Impurities.*—Sulphates, chlorides, and metals.

Action.—Diuretic, saline purgative.

B.P. Dose.—20 to 60 grs. as a diuretic ; $\frac{1}{4}$ to $\frac{1}{2}$ oz. as a purgative.

Enters into.—The preparation of Acid. Tartaric., Ferrum Tart., Antim. Tart., Sod. Tart., Pot. Tart., Conf. Sulph., Troch. Sulph., Pulv. Jalap. Co.

NON-OFFICIAL PREPARATION

1. **Imperial Drink.** *Syn.*—*Potus Imperialis.*—Acid. Pot. Tartrate 1 dr., Glusidum 1 gr., Ol. Limonis 3 ms., Boiling Water to 1 pint ; or Acid Tartrate 1 to $1\frac{1}{2}$ drs., Sugar *q.s.*, Boiling Water to 1 pint, in which half the peel of a fresh lemon has been infused.

PHARMACOLOGY OF POTASSIUM ACETATE, CITRATE, TARTRATE AND ACID TARTRATE

Externally.—All these salts are neutral, except the acid tartrate which is acid. They have none of the antacid or caustic properties of liquor potassæ or alkaline potassium salts.

Internally. Gastro-intestinal tract.—These salts are not irritant to the stomach and are therefore easily borne. Being neutral (one faintly acid), they are **not antacid** like the alkaline potash salts. In large doses ($\frac{1}{4}$ to $\frac{1}{2}$ oz.) they are purgatives. The tartrate and acid tartrate are typical saline hydragogue purgatives. They produce easy liquid motions without griping. They act by stimulating the secretion of succus entericus and hindering its reabsorption (*see* page 128). A portion may possibly be converted into carbonate in the intestine and absorbed as such, but the greater portion is excreted with the fæces. A little of that which is absorbed may be re-excreted into the bowels, thus acting as a **remote purgative**.

Blood.—All potash salts made from vegetable acids are converted into carbonates after absorption into the blood, thereby increasing its alkalinity. They are therefore **indirect alkalinizers** of blood. The alkalinity is not affected if the salt is acid, such as acid tartrate.

Reaching various tissues of the body containing potassium salts, they supply their wants, and thus act in a manner as **restoratives**.

Kidneys.—All these salts in moderate doses are **diuretics**, especially the acetate; the tartrate and acid tartrate acting only in a modified degree. They are direct stimulants to the renal cells. They are speedily eliminated as carbonates, and in their passage through the kidney render the urine alkaline. They are therefore powerful and rapid **alkalinizers of acid urine**. Although the urine becomes alkaline, yet the total amount of acids eliminated is increased. They have a very slight effect on the flow in health.

Skin.—All of them are mild diaphoretics, and are said to act by dilating the cutaneous capillaries, but the method of their action is obscure. Of all these salts, the citrate is considered to be the most reliable diaphoretic.

Note.—These salts act either as diuretics or diaphoretics indiscriminately. If you wish the former effect, you must keep the patient cool; if the latter wrap him up in blankets and administer warm drinks as adjuvants.

THERAPEUTICS OF POTASSIUM ACETATE, CITRATE, TARTRATE AND ACID TARTRATE

Internally. **Gastro-intestinal tract.**—The nascent citrate and tartrate are powerful gastric sedatives, and are therefore prescribed for **gastric irritability**. For this purpose, the carbonate or bicarbonate is given with lemon juice, citric acid and tartaric acid in an effervescent form (see page 189). The tartrate and acid tartrate are used only as saline hydragogue purgatives in **constipation, piles, dysentery**, or for the abstraction of fluid in **dropsy, uræmia, ascites, pleuritic effusion**, &c. For this object they should be given in a concentrated form. Their twofold action on the bowels and kidneys renders them peculiarly serviceable in this class of cases. Pulv. Jalap. Co., or the acid tartrate in lemonade can thus be given as a hydragogue.

Blood.—These salts were formerly largely given in **acute rheumatism**, because they rendered the blood alkaline, but since the salicylates have come into use they are rarely prescribed for this purpose. In **gout**, both the direct and indirect alkaline potash salts are used, with the object of not only holding in solution the excess of uric acid circulating in the blood, but of affecting the "chemistry of the tissues, causing an increased oxidation, and thereby preventing to some extent the formation of uric acid." The citrate of potash has been recommended in **scurvy**, but it cannot replace fresh lemon juice or fresh vegetables.

Kidneys.—These salts are eminently successful in **alkalinizing acid urine**. When we want to maintain its alkalinity for a long period, the citrate is to be selected, as it does not derange the stomach.

Thus they not only prevent the precipitation of uric acid in cases of **uric acid diathesis**, but actually dissolve small **uric acid calculi** in the kidneys or bladder. Sir W. Roberts warns us against using more than 40 to 60 grs. of acetate or citrate in 4 ozs. of water, every 4 hours, for he says that in larger doses they may cause a formation of insoluble biurate on the surface of the stones. To **increase diuresis** the citrate and acetate are chiefly employed. The saline diuretics are largely given in **febrile conditions**, **Bright's disease**, and **renal dropsy** and occasionally in **cardiac dropsy**, on account of their depressing influence on the circulation. For this purpose they are combined with digitalis or scopolium.

Skin.—Occasionally the citrate and acetate are given in fevers to produce diaphoresis. The imperial drink is a pleasant refreshing beverage which is much appreciated by fever patients.

Lungs.—Because these salts are converted into carbonates in the blood, the citrate and acetate are sometimes given as expectorants in **bronchitis** with **viscid secretion**.

POTASSII BICARBONAS. Potassium Bicarbonate



Syn. B.P.—Potassium Hydrogen Carbonate.

Source.—Obtained by saturating a strong aqueous solution of potassium carbonate with carbonic anhydride, $\text{K}_2\text{CO}_3 + \text{CO}_2 + \text{H}_2\text{O} = 2\text{KHCO}_3$.

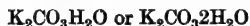
Characters.—Colourless, non-deliquescent, non-corrosive, monoclinic prisms. Taste feebly alkaline. **Solubility.**—1 in 4 of water. **Impurities.**—The same as of carbonate.

Action.—Antacid, sedative, lithontriptic, diuretic.

B.P. Dose.—5 to 30 grs. in solution.

N.B.—20 parts by weight are neutralized by 14 parts of citric and 15 of tartaric acid, whilst the carbonate requires 17 and 18 respectively.

POTASSII CARBONAS. Potassium Carbonate



Syn. B.P.—Salt of Tartar.

Source.—Obtained from the ashes of wood, or by interaction of crude potassium sulphate and crude calcium carbonate and carbon.

Characters.—White, deliquescent, crystalline powder. Taste alkaline, caustic. **Solubility.**—1 in 1 of water. **Impurities.**—Sulphates, chlorides, metals.

Action.—The same as of bicarbonate.

B.P. Dose.—5 to 20 grs.

Enters into.—The preparation of Decoct. Aloes Co., Liq. Arsenicalis. Pot. Caustic., Mist. Ferri Co., Pot. Sulphurat., Pot. Acetas, Pot. Bicarb. Pot. Citras, and Pot. Tartras.

PHARMACOLOGY OF POTASSIUM CARBONATE AND POTASSIUM
BICARBONATE

Externally.—A solution of these salts has actions somewhat resembling those of liquor potassæ. The carbonate is more irritant and corrosive than the bicarbonate, but less so than caustic potash or liquor potassæ. The carbonate is seldom used.

Internally. Gastro-intestinal tract.—The bicarbonate possesses all the properties of potassium salts, without any local irritative effects, and is therefore usually prescribed. Like other alkalis, it momentarily **checks the secretion of alkaline saliva** in the mouth. Reaching the stomach, like the other alkalis, it performs three specific functions, viz.: (1) Given before meals it excites a decided inhibitory action on the gastric glands and checks the flow of weakly acid juice and thus rests the glands. As a result of this rest and recuperation the gastric juice subsequently poured out is increased in strength and potency. (2) Taken after a meal, it neutralizes the excessive **acidity** of the contents of the stomach as well as the gastric juice already secreted; hence it is an **antacid**. (3) It is a **sedative** to the gastric nerves. Very large single doses cause vomiting. Repeated large doses open the bowels by paralyzing their muscular coats.

Blood.—Both these salts are freely absorbed and rapidly excreted, the bicarbonate being converted into carbonate. They temporarily increase the alkalinity of the blood. In anæmic conditions, they raise the hæmoglobin value and the corpuscular richness, especially if combined with iron. If given for any length of time, they cause the quality of the blood to deteriorate and reduce the body weight.

Heart and circulation.—Small doses of potash salts have no influence on the heart. Large doses decidedly **depress the cardiac force**, and toxic doses arrest it in diastole, by directly affecting the cardiac muscles. This effect is most marked if the salt is directly introduced into the veins, when, after a transitory excitement, clonic spasms, paralysis and death occur. With large doses the blood-pressure and pulse-rate fall considerably.

Respiratory tract.—Potash salts stimulate the bronchial secretion, and make the mucus less viscid. They are therefore **expectorants**. Potassium iodide possesses this property in a very marked degree.

Kidneys, &c.—Both the bicarbonate and carbonate, as well as the vegetable potash salts, are eliminated as carbonates, and in this way they stimulate the secretion of urine, and are therefore **diuretics**. They also **alkalinize** the urine and thereby increase its capacity of holding more **uric acid in solution**. Passing over the mucous membrane of the genito-urinary tract, they either exercise a direct

sedative action on it, or by rendering the urine alkaline soothe any irritation that may be present.

Nervous system and muscles.—They are direct depressants to the brain, spinal cord and muscles, hence they must be used with caution. These salts when locally applied in minute doses cause the muscles to contract, but if the application is continued for any length of time, or in larger doses, they paralyse them. They abolish the prolonged contraction produced by veratrine or barium salts.

Toxic action.—Poisoning by caustic potash is rare. The symptoms are similar to those produced by caustic soda (q.v.).

THERAPEUTICS OF POTASSIUM BICARBONATE AND CARBONATE

Externally.—These salts can be given in the same class of cases where liquor potassæ is used. A solution of potassium carbonate (1 dr. to 1 pint) allays the troublesome itching of many skin diseases, such as urticaria, lichen, &c., and as an injection, arrests the discharge in leucorrhœa. A weaker solution ($\frac{1}{2}$ dr. or less, in 1 pint) checks the weeping of raw, red eczema. For this purpose a piece of lint soaked in the lotion is applied to the raw surface and then covered with oiled silk to check evaporation.

Internally.—The bicarbonates are always used in preference to the carbonates and sodium salts in preference to those of potassium. In dyspepsia, where the gastric secretion is grown thin and watery, the bicarbonate can be given a few minutes before food; and where there is epigastric pain, heartburn or acid eructations, it is best administered after food. In gastric irritability, or to render the blood and urine alkaline, it is best given in effervescing form (30 grs. in 1 pint). Thus, it is beneficial in gout as it holds more uric acid in solution. Formerly it was largely prescribed for rheumatism. The writer has at times found good results in chronic rheumatism and rheumatoid arthritis, by combining it with potassium iodide. As an antidote to poisoning by caustic acids, the carbonate or bicarbonate is to be avoided, for it creates carbonic acid gas and so causes risk of rupture of the stomach. Liquor potassæ and other alkaline salts can be used instead. The bicarbonate is used in bronchitis to lessen the viscosity of the expectoration, but large doses cause anæmia of the mucous membrane, and diminish the secretion to dangerous extent.

Caution.—For the reasons already mentioned potassium salts should not be continued too long.

POTASSII BICHROMAS. Potassium Bichromate



Syn. B.P.—Potassium Dichromate, Red Chromate of Potassium.

Source.—Obtained by roasting chrome ironstone with lime in the presence of air, and by treating the resulting chromate with a potassium salt, and subsequently with an acid.

Characters.—Large, orange-red, transparent, triclinic crystals; fuse below redness. **Solubility.**—1 in 10 of water.

Enters into.—The preparation of Chromic Acid.

B.P. Dose.— $\frac{1}{6}$ to $\frac{1}{2}$ gr. in capsule or pill with kaolin.

ACTIONS AND USES

Potassium bichromate is rarely used in medicine, but extensively in arts. In large doses, it causes severe **gastro-enteritis** with collapse. Those who handle this salt, suffer from **eczema**. Dr. Fraser recommends it in **dyspepsia** and **gastric ulcer**. It is best given in pill form on an empty stomach.

Toxic action.—It is a powerful irritant poison.

Antidotes.—Emetics or pump. Albuminous and demulcent drinks, magnesium carbonate, chalk, &c.

POTASSII BROMIDUM

See page 284

POTASSII CHLORAS. Potassium Chlorate



Source.—Obtained by passing chlorine into water holding lime or magnesia in suspension, treating the clarified liquid with potassium chloride and subsequently crystallizing.

Characters.—Colourless, monoclinic crystals. Cool saline taste. **Solubility.**—1 in 16 of cold, 1 in 3 of boiling water.

Incompatibles.—Explodes when rubbed with sulphur, sulphides, charcoal, sugar, tannic acid, ammonium chloride, or glycerin. Mineral acids, ferrous salts.

Action.—Local stimulant and antiseptic.

B.P. Dose.—5 to 15 grs. in solution or tablets.

Enters into.—The preparation of Pot. Permanganas and the

OFFICIAL PREPARATION

1. **Trochiscus Potassii Chloratis.**—3 grs. in each, white. **Dose.**—1 to 6.

NON-OFFICIAL PREPARATIONS

1. **Gargarisma Chlorig**, B.P.C. **Syn.**—*Chlorine Gargle.*—Pot. Chloras 2·25, Acid Hydrochlor. ·5, Distilled Water to 100. Generate chlorine gas by mixing chlorate and acid, and dissolve it gradually in water.

2. **Voice Tablets.**—Tablets of Potassium Chlorate, 5 grs. each. **Tablets of Potassium Chlorate and Borax.** Tablets of Potassium Chlorate, Borax, and Cocaine Hyd.

PHARMACOLOGY

The actions of potassium chlorate are not identical with those of the other potassium salts.

Externally.—Coming in contact with a septic surface, or discharge, it is decomposed, and oxygen is liberated. This nascent oxygen then acts as a **stimulant and antiseptic to living tissues**, but it is not an antiseptic in the ordinary sense of the term, as outside the body it has very little effect, even upon the most sensitive bacteria.

Internally. **Gastro-intestinal tract and liver.**—In small doses, potassium chlorate has no action, but in large doses, it causes *gastro-intestinal irritation* with vomiting and purging.

Heart and circulation.—Small doses have no action on the heart, but large doses **depress** it, sometimes even causing death. A small portion is converted into a chloride in the blood, and the rest is excreted unchanged with the urine and other secretions. According to Binz the salt is reduced in the blood-stream and thus free oxygen is given off to the tissues, but Coghill considers that its mere presence in the blood is enough to oxygenate it. Whatever may be the exact truth, it is a fact that it has some alterative and stimulating influence on the unhealthy mucous surfaces and on the functions of the secreting structures. In very large doses, it disintegrates the red blood-corpuscles, and **converts hæmoglobin into methæmoglobin**, thus turning the red blood brown, and making the skin cyanotic. If the blood of a patient poisoned by potassium chlorate be shaken up with air or oxygen it does not regain its arterial colour (distinction from ordinary cyanosis). These changes in the blood are accelerated by—

- (1) Addition of large quantity of sodium carbonate.
- (2) Warmth.
- (3) Carbonic acid and the acid phosphates.
- (4) Diminished alkalinity of the blood.

These facts should be carefully remembered as they have an important bearing on the question of the treatment of disease by means of the large doses of the drug.

Kidneys.—In moderate doses (15 to 20 grs.) it acts as a diuretic and more powerfully during pregnancy. In toxic doses, the kidneys become congested, the urine becomes bloody or dark-coloured, and at last there is complete suppression. Death occurs usually from uræmia.

Secretions.—It influences peculiarly the salivary, buccal and mammary secretions, which increase if deficient and decrease if excessive. The bronchial secretion is also increased.

Toxic action.—It is no longer reckoned as an inert substance, for poisoning has occurred in doses not considered toxic, though given freely. Cyanotic appearance, vomiting, purging, hæmaturia, suppression of urine, dyspnoea, and cardiac weakness are some of the chief symptoms. 7 drs. have caused death.

As it formerly happened that, in many cases of poisoning from potassium chlorate, the symptoms were erroneously attributed to diphtheria, so on

the other hand, in fatal cases of diphtheria which have been treated by the chlorate, the symptoms may very easily be mistaken for those of poisoning from the chlorate. When such cases form the subject of legal enquiry, great care and caution are necessary in forming an opinion upon them.

THERAPEUTICS

Externally.—Potassium chlorate is never used for washing **ulcers, wounds, sinuses or suppurative cavities**, though a lotion (5 to 6 grs. in 1 oz.) can be usefully employed for this purpose.

Internally.—Its chief local use is in the treatment of many mouth and throat diseases, such as **aphthous, ulcerative and gangrenous stomatitis, follicular tonsillitis, and follicular pharyngitis**. A lotion (10–15 grs. to 1 oz. of water, or any astringent infusion) is an excellent gargle for such cases. Tablets or lozenges may be slowly sucked. The powdered salt locally applied to **spongy gums, and aphthous spots** on the gums, cheek and tongue, conduces to their rapid healing.

These catarrhal conditions of the mucous membrane of the mouth and fauces are greatly benefited if the local treatment is accompanied by internal administration, for the salt is excreted with the saliva after absorption, and thus locally influences the disease. Its efficacy is greatly increased if it is combined with borax, or in case of **hoarseness of voice**, with borax and cocaine. Certain blood diseases, such as **hæmorrhagic purpura, epistaxis, hæmaturia**, are said to improve under potassium chlorate (Hankin). It is now rarely used in **diphtheria**, though still occasionally employed in **croup** and acute and chronic **bronchitis**. As a supposed oxygenating agent, some yet prescribe it for **low fever** and **blood poisoning**. The writer considers this drug to be a valuable diuretic in the **suppression of urine in cholera**.

Prescribing hints.—In order to avoid misadventure, the following points must be carefully borne in mind:—(1) Pot. chloras must be *given cautiously* when the *temperature is high*, or when the *breathing or circulation is embarrassed*, for in fever the alkalinity of the blood is lessened, and if there is dyspnoea, the tension of the carbonic acid in the blood is raised. (2) *Never give a large dose on an empty stomach*, as it will then be absorbed too rapidly. (3) *Withhold it altogether in disease of the kidney*, as owing to the diminished excretion of urine, it may readily accumulate to an undesirable extent. (4) *When the patient is unable to take food*, the use of the remedy should be limited to painting the fauces with a solution which should not be stronger than 5 p.c. (5) When giving the remedy in larger doses avoid the *simultaneous use both of free acids and mineral waters rich in carbonic acid*. (6) The *total amount given in 24 hours* should not exceed:—

(a) For an infant	20 grs.
(b) For a child	30 grs.
(c) For an adult	90 grs.

POTASSII IODIDUM

See page 486

POTASSII NITRAS. Potassium Nitrate



Syn. B.P.—Nitre, Saltpetre. **Syn. I. V.**—*Sorá*, Beng. *Shorá*, Hind.

Source.—May be obtained by purifying crude nitre, or by the interaction of sodium nitrate and potassium chloride. The crude nitre is chiefly found in the surface soil of India.

Characters.—White crystalline or striated, six-sided, colourless prisms. Taste cool, saline. **Solubility.**—1 in 4 of cold, 2 in 1 of boiling water. **Impurities.**—Chlorides, sulphates, lime.

Action.—Diuretic, diaphoretic.

B.P. Dose.—5 to 20 grs. in solution.

Enters into.—The preparation of Argenti Nitras Induratus and Argenti Nitras Mitigatus.

NON-OFFICIAL PREPARATIONS

1. **Charta Nitrata, B.P.C.** **Syn.**—*Saltpetre Paper*.—Are made by saturating white blotting paper in a 20 p.c. solution of nitre. The fumes are inhaled in *asthma*. **Ozone Papers** are similar in composition.

2. **Charta Nitrata et Chlorata.**—Soak blotting paper in a concentrated solution of nitre and potassium chlorate and dry. In *asthma*. (Suggested by Ringer. The whole room should be filled with the fumes.)

3. **Pulv. Lobelia Comp. B.P.C.** **Syn.**—*Asthma Powder*.—Potassium Nitrate 25, Boiling Distilled Water 25, dissolve and soak a mixture of Lobelia, and Stramonium leaves each 25, add Black Tea to produce 100. Mix well, dry, and add oil of anise $\cdot 1$. One teaspoonful may be burnt to fumigate a bedroom, or the fumes inhaled in *asthma*. This is a supposed imitation of *Himrod's*, *Bliss's*, and the *Green Mountain Cures*.

PHARMACOLOGY

Externally.—Potassium nitrate is slowly absorbed by the unbroken skin, and produces a local **refrigerant** action, by reducing the circulation of the part.

Internally. Gastro-intestinal tract.—Being very diffusible, it is very readily absorbed, and quickly eliminated **unchanged**. Large doses cause **gastro-enteritis** and even death from excessive vomiting and purging. Buchheim considers that these effects are entirely due to diffusion.

Heart and blood.—Of all the potash salts, it is the most **powerful depressant** to the heart, rendering its action slower and weaker. It destroys the normal oxygenating powers of the red blood-corpuscles, and in large doses lowers the **coagulability** of the blood. The depression of the heart is due to (1) reflex irritation starting from the

viscera, (2) to admission of an abnormal amount of potassium into the blood through the relaxed vessels, (3) possibly a partial reduction of the nitrate to the *poisonous nitrite*.

Skin and kidneys.—It is slightly **diaphoretic**. Its action on the kidneys is similar to that of the potassium chlorate, but more **powerful**. It is passed with the urine **unchanged**.

THERAPEUTICS

Externally.—A concentrated solution of nitrate with or without indigo blue is frequently applied by Indian mothers to the abdomen of infants to relieve tympanitis or to produce diuresis.

Internally.—Nowadays its use is almost discarded. The tablets can be slowly sucked in **relaxed sore throat**. Formerly it was employed in almost every **febrile and inflammatory** disease, but now only on rare occasions. The writer has at times observed very good effects in **acute pleurisy** of asthenic type. He gives it with antimonial wine. It is no longer used in **rheumatism**, but it is a capital remedy for arresting the onset of a **gouty attack**, or for removing the headache due to a debauch. 20 grs. of nitrate with 30 grs. of potassium bicarbonate in a tumbler of soda water is the best method of administration in such cases. In inflammatory conditions of the **trachea** and **bronchi**, it is still considered a reliable antiphlogistic and expectorant. As an inhalation it cuts short an **asthmatic fit** remarkably well, and hence it is the basis of many nostrums, such as Himrod's Cure, Green Mountain, &c. Charta nitrata or charata nitrata et chlorata can be burnt, and the fumes inhaled. As a diuretic, preference is given to potassium acetate and citrate.

Caution.—Its use is to be avoided in inflammation of the stomach, intestines, bladder and kidneys, and cardiac weakness.

POTASSII PERMANGANAS

Potassium Permanganate. $K_2Mn_2O_8$

Source.—May be prepared by the interaction of potassium chlorate, potassium hydroxide, and manganese dioxide. $6KHO + KClO_3 + 3MnO_2 = 3K_2MnO_4 + KCl + 3H_2O$. The potassium manganate becomes permanganate by boiling thus :



Characters.—Dark purple, slender, prismatic, iridescent crystals; taste sweet, astringent. *Solubility.*—1 in 10 of cold water. *Impurities.*—Carbonates, chlorides, sulphates, and dioxide of manganese.

Incompatibles.—Oxidizable substances, especially organic ones, and any reducing agent.

Action.—Antiseptic, deodorant, emmenagogue.

B.P. Dose.—1 to 3 grs. with kaolin (*see* p. 86) or in solution.

OFFICIAL PREPARATION

1. **Liquor Potassii Permanganatis.**—1 in 110 ms. Of a disagreeable taste. **Condy's fluid** is only of half the strength. **B.P. Dose.**—2 to 4 drs. in distilled water.

NON-OFFICIAL PREPARATIONS

1. **Calcium Permanganate.** *Syn.*—*Monol.*—Brown, deliquescent crystals, soluble in water. Sterilizes water (1 in 100,000). Said to be useful in *enteritis* and *diarrhœa* of children. *Dose.*—1 to 2 grs.

2. **Sodium Permanganate.**—Green, soluble in water. A cheap antiseptic.

3. **Zinc Permanganate, B.P.C.**—Violet-brown, deliquescent, soluble in water. Powerful antiseptic and non-irritant; as an injection in *gonorrhœa*.

PHARMACOLOGY

Externally.—Potassium permanganate in its solid form is an irritant and even caustic, and in solution a stimulant. Apart from its local actions on the human body, it is a valuable **oxidizing agent**, giving off oxygen when moist and in the presence of organic matter, thus destroying decomposing ferments and septic germs. Therefore, it is an **antiseptic deodorant** and **disinfectant**. The only drawback is that the article is expensive and yields up oxygen too quickly, rendering it inert after a short time; consequently its germicidal powers are limited.

Internally.—It is an unstable compound, being decomposed into manganese dioxide in the stomach, in which form it is probably absorbed. Manganese salts have **no hæmatinic** property as was once supposed; in fact, nothing definite is known of their action on the blood and tissues. When injected into the blood, or subcutaneously, they are excreted by the intestine and kidneys. Ringer considers it a useful **emmenagogue**. He has not seen abortion follow its use, though others have done so.

THERAPEUTICS

Externally.—For rapidly disinfecting stools and foul discharges, washing bed-pans, articles, and hands after contact with infectious diseases, for flushing water-closets and drains, potassium permanganate in solution (1 in 150) is an excellent antiseptic and deodorant. Being odourless and non-irritant, it is best suited for use at the bedside. Fabrics are stained by it, but the stain is easily removed by sulphurous acid; but they must be immediately washed, otherwise they would be damaged by the sulphuric acid formed. A weaker lotion (2 grs. to 10 ozs. of distilled water) can be used as a wash for **foul or suppurating ulcers, abscesses, ozæna**; or as a uterine or vaginal douche after **parturition** or in **cancer of the os**. As an injection ($\frac{1}{2}$ gr. to 1 oz.) in **gonorrhœa** and (1 gr. to 1 oz.) in **gleet** it has given good results. A lotion (1 gr. to 2 ozs.) can be used with benefit in **burns**

scalds and frost bites. A saturated solution (1 in 20) is an excellent application in **bites** by poisonous snakes and rabid dogs, if it can be immediately applied. A 15 p.c. solution can also be freely injected into the subcutaneous tissues for this purpose, but it must be noted that its contact with the virus is essential and therefore it is useless to try it some hours after the bite has been inflicted and when the virus has entered the circulation. It is largely employed in dyeing white hair to a chestnut-brown. Its use in the bites of poisonous snakes has recently been strongly advocated by Lauder Brunton and Rogers. A special lancet has been designed for the use of the public. The wound is freely opened up by the lancet and the pure crystals rubbed into the wound made by the specially designed handle of the lancet.

Internally.—Potassium permanganate makes a very effective gargle (2 grs. to 10 ozs. or the official solution diluted to 1 in 50) in **foul and ulcerative** diseases of the gums, mouth and throat, such as **ulcerative and gangrenous stomatitis**. On account of its powerful oxidizing property, it is the best **antidote** for opium and morphine poisoning, if it can be given soon after the swallowing of the poison (see p. 526). It is also a successful antidote to phosphorus poisoning. As an emmenagogue it is strongly recommended in **delayed, deficient or arrested menstruation**, but the writer has not found much benefit from its use. It is no longer used in **diabetes, infective fevers** or **anæmia**. It can be given in pill or solution. There is a danger of ulceration being caused by the tablets. Liqr. Pot. Permanganatis is disagreeable to swallow.

Rogers in cholera strongly urges the administration of a drink of calcium permanganate gr. 4 to the pint of boiled water. If necessary a further dilution may be made, but cholera patients usually drink it without complaint. 4 grs. of calcium permanganate is equivalent to 8 grs. of the K. salt. It may be given *ad libitum*, at the same time he administers pills of 2 grs. of potassium permanganate made up with kaolin and coated with salol. This treatment combined with infusion of hypertonic saline solution has in his hands yielded brilliant results.

POTASSII SULPHAS. Potassium Sulphate



Source.—May be obtained by purifying the crude salt, or by the interaction of sulphuric acid and potassium chloride or some other potassium salts.

Characters.—Colourless, hard, rhombic prisms, terminated by 6-sided pyramids. **Solubility.**—1 in 10 of cold and 1 in 4 of boiling water.

Impurities.—Chlorides, nitrates, and other metals.

Action.—A mild cathartic.

B.P. Dose.—10 to 40 grs.

Enters into.—Pil. Colocynth. Co., Pulv. Ipecac. Co., and their preparations :—Pil. Colocynth. et Hyos. and Pil. Ipecac. c. Scilla.

NON-OFFICIAL PREPARATION

1. **Sal Polychrestum.** *Syn.*—*Glaser's Salt.*—A mixture of potassium Sulphate and Sulphite. In *dyspepsia* and *chronic skin diseases*. *Dose.*—30 to 120 grs.

PHARMACOLOGY AND THERAPEUTICS

Internally.—It is a mild **saline purgative**, acting by stimulating the glandular secretion of the intestine, and is a **hepatic stimulant**. In pharmacy, it is chiefly used to help the pulverization of tough substances, as ipecacuanha root. Therapeutically it is rarely used.

ADDITIONAL PREPARATIONS OF POTASSIUM

1. **Potassii Auro-Cyanidum.**—White soluble crystals. Prevents the growth of anthrax bacilli when injected into the blood.

2. **Potassii Benzoas.**—*See* p. 275.

3. **Potassii Cantharidas.**—*See* p. 314.

4. **Potassii Cobalto-nitris.**—Yellow crystals, slightly soluble. Causes less discomfort than other nitrites. In *uræmic dyspnœa* and *asthma*. *Dose.*— $\frac{1}{2}$ gr.

5. **Pot. Glycerophosphas, B.P.C.**—50 p.c. solution. Soluble in water. Nervine tonic. In *neurasthenia*, *phosphaturia*. *Dose.*—5 to 10 grs.

6. **Potassii Hypophosphis, B.P.C.**—Explodes when triturated or heated with nitrate, chlorate, or other oxidizing agents. Alterative. *Dose.*—1 to 5 grs.

7. **Potassii Nitris.**—A crystalline deliquescent powder, used as a vasodilator in *migraine*, *asthma*, *epilepsy*. *Dose.*— $\frac{1}{4}$ to $\frac{1}{2}$ grs.

A powder consisting of Pot. Nitris $\frac{1}{2}$ gr., Pot. Nitras 18 grs., and Pot. Bicarb. 25 grs., given in a tumbler of water early in the morning, reduces blood-pressure and has checked recurrent *epistaxis*. It may be tried in *gout*.

8. **Potassium Osmate.**—Reddish crystalline powder, soluble in water. With bromides in *epilepsy*, and hypodermically in *sciatica* and other *neuralgias*. *Dose.*— $\frac{1}{10}$ gr. per day.

9. **Potassii Phosphas, B.P.C.**—A deliquescent, granular powder. Alterative in *phthisis*, *rheumatism*, &c. *Dose.*—10 to 30 grs.

10. **Potassii Salicylas, B.P.C.** *See* p. 200.

11. **Potassii Succinas.**—A deliquescent powder. Hæmostatic. *Dose.*—5 to 10 grs.

12. **Potassii Telluras.**—White, crystalline, soluble. Reduces or arrests night and day sweats of phthisis. Communicates a garlic odour to the breath. *Dose.*— $\frac{1}{2}$ gr. in pill daily.

PRUNI VIRGINIANÆ CORTEX

Virginian Prune Bark. N.O. *Rosaceæ*

Syn.—Wild Cherry Bark.

Habitat.—North America.

Source.—The bark of *Prunus serotina*, collected in autumn.

Characters.—Curved pieces or irregular fragments, $\frac{1}{4}$ in. or more thick. Young bark smooth, reddish-brown, marked with transversely elongated lenticels, and granular fracture. Old bark rough and nut-brown. Taste

astringent, aromatic, bitter. Odour, after maceration with water, like bitter almonds.

Composition.—(1) An amorphous *glucoside* resembling *laurocerasin*. (2) An *enzyme* allied to but not identical with *emulsin*. These two bodies yield hydrocyanic acid in the presence of water. (3) A bitter principle, tannin, starch, resin, &c.

Action.—Nervine sedative and a flavouring agent.

OFFICIAL PREPARATIONS

1. **Syrupus Pruni Virginianæ.**—3 in 20. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.
2. **Tinctura Pruni Virginianæ.**—1 in 5. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.

PHARMACOLOGY

Internally.—The Virginian prune bark possesses very mild **stomachic** and **tonic** virtues, which are greatly antagonised by the tannin it contains. Its liquid preparations are **sedative**, because minute quantities of hydrocyanic acid are formed during the process of preparation.

THERAPEUTICS

Internally.—Because both the syrup and the tincture contain essential oil, they are used as **flavouring** agents. The syrup is largely employed as a sweetening and flavouring agent in cough mixtures, but it can also allay **cough** in teaspoonful doses, on account of its sedative virtues. The tincture is recommended in **dyspepsia**, **chronic bronchitis**, **fatty heart**, **palpitation**, **mitral regurgitation**, &c.

PRUNUM. Prunes

N.O. *Rosaceæ*

Syn.—Pruni, French Plums.

Habitat.—South of France.

Source.—The dried ripe fruits of *Prunus domestica*.

Characters.—Ovoid or oblong, $1\frac{1}{2}$ in. long, black, shrivelled; pulp brownish, without marked odour; taste sweet, bland, acidulous.

Composition.—(1) *Sugar*. (2) *Malic acid*. (3) A purgative principle.

Action.—A gentle aperient.

Enters into.—Conf. Sennæ.

PHARMACOLOGY AND THERAPEUTICS

Internally.—Prunes are slightly **laxative**, **demulcent** and **nutritive**, and are therefore largely consumed as an article of food, especially by those who suffer from habitual constipation. When stewed they make a tempting dish for constipated children.

PTEROCARPI LIGNUM

Red Sanders Wood. N.O. *Leguminosæ*

Syn. B.P.—Red Sandal-wood. **Syn. I. V.**—*Ractachandan*, Beng. *Lal Chindan*, Hind.

Habitat.—Southern India and Ceylon.

Source.—The heart-wood of *Pterocarpus santalinus*.

Characters.—Large heavy logs; dark reddish-brown externally; deep blood-red internally; taste slightly astringent; odour faintly aromatic.

Resembles.—Logwood which is less dense and more astringent.

Composition.—(1) *Santalic acid* or *Santalin*, red colouring matter.
(2) *Pterocarpin* and *homopterocarpin*, two colourless crystalline substances.

USE

It is only used to colour compound tincture of lavender.

PULSATILLA. B.P.C. Wood Anemone

(Non-official). N.O. *Ranunculaceæ*

Syn.—Pasque flower, Wind flower.

Habitat.—England, Germany.

Source.—The flowering herb of *Anemone pulsatilla*.

NON-OFFICIAL PREPARATIONS

1. **Anemonin.** *Syn.*—*Pulsatilla Cumphor*.—White crystals, easily crumpled, sparingly soluble in water. *Dose.*— $\frac{1}{10}$ to $\frac{1}{2}$ gr.
2. **Tinctura Pulsatillæ, B.P.C.** (1 in 10). *Dose.*—5 to 30 ms.

PHARMACOLOGY AND THERAPEUTICS

It paralyses the medulla oblongata and spinal cord, having especial influence upon the cardiac and respiratory centres. It slows the heart's action and diminishes voluntary movement. It also has a specific action upon the generative organs. Useful in **bronchitis**, **pertussis** and **asthma**, but its special value is in the treatment of **dysmenorrhœa**. Tincture of Pulsatilla, given in doses of 1 minim every hour until the pain abates, is recommended for **orchitis** and **epididymitis**, was tried at the Lock Hospital and found to be valueless. For the treatment of dysmenorrhœa it is usual to combine Pulsatilla with Caulophyllin, the active principle of *Caulophyllum thalictroides*, the blue cohosh or squash root. A convenient form of administration is Oppenheimer's Liquor Caulophylli et Pulsatillæ, the dose of which is 1 to 2 drs. given in water three times a day. It should be commenced a week before the period is expected and continued until the flow is fully established.

PYRETHRI RADIX. Pyrethrum Root

N.O. *Compositæ*

Syn.—Pellitory root. **Syn. I. V.**—*Akarkara*, Beng., Hind.

Habitat.—Algeria, Levant.

Source.—The dried root of *Anacyclus pyrethrum*.

Characters.—Unbranched pieces, 2 to 4 in. long, $\frac{1}{2}$ in. or more thick, cylindrical, or tapering towards both extremities; the crown bearing a tuft of colourless hairs. Brown externally, and wrinkled longitudinally.

Fracture short. Odour characteristic. Taste pungent, excites a copious flow of saliva when chewed. Easily recognised by the pricking sensation when chewed.

Resembles.—*Taraxacum*, which is darker and has a bitter taste only.

Composition.—(1) A crystalline alkaloid *Pyrethrine*. (2) *Resins*. (3) *Inulin*, a white powder resembling starch. (4) 2 fixed oils.

Action.—Powerful sialagogue.

OFFICIAL PREPARATION

1. **Tinctura Pyrethri.**—1 in 5. Dark sherry coloured.

PHARMACOLOGY AND THERAPEUTICS

Internally.—Pellitory root when chewed produces a burning sensation, soon followed by tingling, numbness, and copious secretion of saliva, from the stimulation of the nerves and blood-vessels, and those of the salivary glands. After a while the nerves are depressed. It is therefore a **powerful sialagogue**, and a slight **anæsthetic**. On account of these properties, it is used to relieve **toothache, relaxed uvula and sore throat**. It is also serviceable in **paralysis of the tongue**, for it stimulates its nerves. The tincture can be put within a carious tooth, and can be used as a **gargle** (1 dr. to 2 ozs.). Roth speaks well of it in **globus hystericus**.

PYROXYLINUM. See page 426

QUASSIÆ LIGNUM. Quassia Wood

N.O. *Simarubaceæ*

Habitat.—Jamaica.

Source.—The wood of the trunk and branches of *Picroëna excelsa*.

Characters.—Logs exceeding 6 in. in diameter, yellowish-white, tough, dense, but easily split. Inodorous. Taste intensely bitter. Often seen in chips or shavings.

Resembles.—*Sassafras*, which is aromatic and not bitter.

Composition.—(1) *Quassin*, a bitter principle. (2) A *volatile oil*. Contains no tannin.

Action.—A simple bitter.

OFFICIAL PREPARATIONS

1. **Infusum Quassie.**—88 grs. to 1 pint ($\frac{1}{4}$ hour). B.P. Dose.— $\frac{1}{2}$ to 1 oz.
2. **Liquor Quassie Concentratus.**—1 in 10. B.P. Dose.— $\frac{1}{2}$ to 1 dr.
3. **Tinctura Quassie.**—1 in 10. Straw-coloured. B.P. Dose.— $\frac{1}{2}$ to 1 dr.

NON-OFFICIAL PREPARATION AND SUBSTITUTES

1. **Quassin.** *Syn.*—*Picrosmin*, B.P.C.—A white crystalline neutral body slightly soluble in water. Stomachic, tonic. Dose.— $\frac{1}{6}$ to $\frac{1}{2}$ gr.

2. The wood of *Picroëna Quassioides* (*Charangi*, *Beng.*) is not so bitter as true quassia, though it contains the same bitter principle *quassin*. The bark and root are more bitter. It can be used as a substitute.

PHARMACOLOGY AND THERAPEUTICS

Internally.—Quassia wood closely resembles calumba in actions and uses. It is a **pure bitter** without astringency, and acts as a poison to flies, fish, and worms infesting the rectum of human subjects. Being devoid of flavour, it is intensely bitter and is therefore not so agreeable to the stomach as gentian or chiretta. It can be given in the same class of cases where calumba or gentian is indicated, but being free from tannic acid, it can be combined with iron. A strong infusion makes an excellent **anthelmintic enema** for thread-worms.

QUILLAIA CORTEX. Quillaia BarkN.O. *Rosaceæ***Syn. B.P.**—Panama Bark, Soap Bark.**Habitat.**—Chili.**Source.**—The inner part of the bark of *Quillaja saponaria*.**Characters.**—Flat pieces $\frac{1}{8}$ in. thick, 2 ft. long, 4 in. wide. Outer surface brownish-white, or reddish-brown; inner surface smooth, white or yellowish-white. Taste astringent, acrid. Powder irritates nostrils.**Composition.**—(1) *Sapotoxin*, and (2) *Quillaic acid*, closely allied to Saponin (see Senega root).**Action.**—Emulsifier and expectorant.**Enters into.**—The preparation of Liq. Picis Carbonis and the

OFFICIAL PREPARATION

1. **Tinctura Quillaie.**—1 in 20. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.

PHARMACOLOGY AND THERAPEUTICS

Externally.—The powdered soap bark is very irritant to the nostrils, giving rise to a nasal discharge, sneezing, and sometimes cough, and its inhalation is therefore recommended in acute and chronic catarrhal **rhinitis**. It is a local stimulant to **chronic ulcers**, and Shoemaker has been very successful in treating cases of this description by the application of bandages soaked in the infusion. He treats **pityriasis**, **dandruff**, **bromidrosis**, **hyperidrosis** in the same manner.

Internally.—Quillaia bark contains five times more **saponin** or **senegin** than **senega**, and is therefore a more powerful **expectorant**. It may be given in **chronic bronchitis**, and **emphysema** with deficient expectoration, but its use is contra-indicated in hæmoptysis, or ulceration of the throat and alimentary canal, on account of its irritant properties. Because it contains a large percentage of saponin, it is largely employed for **emulsifying** insoluble drugs: the only objection to its free use is that *sapotoxin*, which is an ingredient of saponin, is a dangerous blood poison, breaking up the blood-corpuscles. It is said to be useful in **amenorrhœa**. The decoction may be used as a substitute for inf. **senega**.

QUININÆ HYDROCHLORIDUM

See page 343

RESINA. Resin

N.O. *Coniferae***Syn.**—Rosin, Colophony.**Source.**—The residue left after the distillation of the oil of turpentine from the crude oleo-resin (turpentine) of various species of *Pinus*.**Characters.**—Translucent, light amber coloured, compact, brittle, pulverizable; fracture shining; odour and taste terebinthinate. Burns with yellow flame and much smoke. **Solubility.**—Freely in alcohol (90 p.c.), ether, benzol, carbon bisulphide.**Composition.**—The chief constituent is an organic acid, *Abietic acid*, which is converted into a soluble salt by alkalies.**Enters into.**—The preparation of 8 plasters and the

OFFICIAL PREPARATIONS

1. **Emplastrum Resinae.** *Syn. B.P.*—*Adhesive Plaster.*—1 in 9½. A pale yellow solid.2. **Unguentum Resinae.** *Syn.*—*Basilicon Ointment.*—1 in 4 (nearly). A yellowish-brown stiff ointment. Stimulant to indolent sores.

NON-OFFICIAL PREPARATION

1. **Resinol.** *Syn.*—*Rosinol, Retinol.*—A non-saponifiable, non-irritant, yellowish, oily product of dry distillation of resin. Dissolves phosphorus, naphthol, camphor, creosote, cocaine, iodol, aristol, &c., and makes a good non-irritating stable basis for ointment. Powerfully *antiseptic* and *antipruritic*. Used in *eczema, impetigo, scabies, hæmorrhoids*. Internally, in *rheumatism, bronchitis, gonorrhœa*. *Dose.*—1 dr. in capsules.

PHARMACOLOGY AND THERAPEUTICS

Externally.—Resin is **antiseptic** and mildly **stimulant**, and is therefore useful in indolent **ulcers, wounds, and sores**. Basilicon ointment is an excellent application for this purpose, but is apt to prove too stimulating if used for any length of time. Its chief use now is in pharmacy, to impart consistence and adhesiveness to plasters and ointments.

RHEI RADIX. Rhubarb Root

N.O. *Polygonaceæ***Syn.**—Turkey Rhubarb.**Habitat.**—China and Thibet.**Source.**—The erect rhizome or so-called root of *Rheum palmatum*, *Rheum officinale*, and other species, deprived more or less of its cortex and dried.**Characters.**—In cylindrical, barrel-shaped, conical, plano-convex, or irregular pieces. The surface sometimes covered with a bright yellowish-brown powder. Rounded or angular, smooth, showing beneath dark red

lines, intermixed with the reddish-brown substance of the root, usually presenting small scattered, star-like marks. Frequently the pieces are bored with a hole which sometimes contains the remains of the cord used to suspend them while drying. The root is hard and compact, presenting a marbled, red and white appearance. Odour characteristic, aromatic. Taste slightly bitter, astringent, and gritty. *Impurities*.—English rhubarb, which has a different taste, odour, and an excess of starch. Turmeric, which becomes brown on addition of boric acid.

Composition.—(1) *Chrysarobin* is the chief, and is the colouring and purgative principle. (2) *Chrysophanic acid*, or dioxymethylantraquinone. Probably formed by the oxidation of chrysarobin. (3) *Emodin*, or trioxymethylantraquinone. (4) *Rheo-tannic acid*. (5) Oxalate of lime (35 p.c.). (6) Other substances, as *phaeolin*, rheumatic acid, resin, starch, &c.

Action.—Stomachic tonic, astringent, purgative.

B.P. Dose.—3 to 10 grs. for repeated use; 15 to 30 grs. for a single dose, 3 grs. for a child 1 year old.

OFFICIAL PREPARATIONS

1. **Extractum Rhei**.—A brown dry extract. **B.P. Dose**.—2 to 8 grs.
2. **Infusum Rhei**.—1 in 20 ($\frac{1}{4}$ hour). **B.P. Dose**.— $\frac{1}{2}$ to 1 oz.
3. **Liquor Rhei Concentratus**.—1 in 2. **B.P. Dose**.— $\frac{1}{2}$ to 1 dr.
4. **Pilula Rhei Compositae**.—1 in 4 (nearly). **B.P. Dose**.—4 to 8 grs.
5. **Pulvis Rhei Compositus**. *Syn.*—*Gregory's Powder*.—Pale yellow. Antacid, stomachic, purgative. **B.P. Dose**.—20 to 60 grs. in milk. 5 grs. for a child 1 year old.
6. **Syrupus Rhei**.—1 in 15. Brown, thick. The B.P. formula is unsatisfactory. Squire recommends a (1 in 4) fluid extract of rhubarb with alcohol (60 p.c.). Evaporate 8 ozs. to 3 ozs. Mix this and oil of coriander 5 ms. with sugar 24 ozs., and water to 40 ozs. by weight. Dissolve without heat and strain. **B.P. Dose**.— $\frac{1}{2}$ to 2 drs.; $\frac{1}{2}$ dr. for a child 1 year old.
7. **Tinctura Rhei Composita**.—1 in 10. Dark brown. **B.P. Dose**.— $\frac{1}{2}$ to 1 dr. for repeated use; 2 to 4 drs. for a single dose.

NON-OFFICIAL PREPARATIONS

1. **Elixir Rhei, B.P.C.** *Syn.*—*Sweet Essence of Rhubarb*.—Rhubarb 25. Fennel 10. Macerated repeatedly with alcohol and water (1 in 3) 75, and to the resulting tincture, add Glycerin 15 and Sugar 20; the whole quantity being 100. *Dose*.—1 to 3 drs.
2. **Mistura Rhei c. Soda, B.P.C.**—Mild laxative, stomachic, and antacid. Rhubarb 5 grs., Sodium Bicarb. 10 grs. in Caraway Water 1 oz. *Dose*.— $\frac{1}{2}$ to 1 oz.

PHARMACOLOGY

Externally.—The percentage of chrysarobin in rhubarb is not enough to produce any local action by direct application.

Internally. Alimentary canal and liver.—Rhubarb tinges the saliva and increases its flow. In small doses (2 to 5 grs.), it stimulates

the secretion of the gastric juice and the peristalsis of the stomach. It is therefore a **stomachic** and **tonic**. In the intestine, it performs two definite functions. (1) In large doses (20 to 30 grs.), it increases the secretion of the intestinal glands and the peristaltic movements, and thus acts as a mild **purgative**. This is the result of the effects of chrysophanic acid and emodin, both anthraquinone derivatives, and it is believed that most vegetable purgatives owe their properties to this or its derivatives. Purging occurs within 4 to 8 hours, often accompanied by griping, and the stool is liquid and yellow, the colour being derived from the excess of bile, and chrysarobin, the pigment. (2) After opening the bowels, the rheo-tannic acid in the rhubarb constipates by arresting the glandular secretion of the intestine. This **astringent** action may also be produced by small doses of the drug; but it must be noted that the action of rheo-tannic acid is slower than that of chrysarobin.

Some of the ingredients of rhubarb are absorbed into the blood and go to stimulate the secretion of bile, without affecting any of the biliary constituents. The flow of bile is not so copious as to cause purgation. Therefore, it is a mild **hepatic stimulant**.

Elimination.—Chrysarobin has been found in the milk, and largely in the urine, both of which are coloured by it. It makes the milk bitter and purgative. Rheo-tannic acid is excreted by the bowels.

THERAPEUTICS

Externally.—As chrysophanic acid is excreted in the perspiration, it may be given internally in **psoriasis**, but it is never administered with this object.

Internally.—Rhubarb is largely employed in **infantile ailments**. It is an excellent remedy for the **dyspepsia** of children, especially when caused by a faulty diet. It expels undigested food, and produces first a soothing and afterwards an astringent effect. Goodeve's Red Mixture (*see* p. 492) is largely employed for this purpose in this country. In fact, it is one of our everyday nursery remedies. Similarly, it is most effective in controlling **infantile diarrhoea**, produced by undigested food, or other irritating matter; here we look for the after astringent effect. Gregory's powder, which may be administered in milk, is a very useful aperient in many **gastric and abdominal troubles** of childhood. Syrupus Rhei or Elixir Rhei may be used instead, as they are palatable and do not gripe. As a pure purgative, it cannot be prescribed alone, on account of its griping and after constipating properties, but combined with an equal quantity of soda, or with other purgatives, as Pil. Rhei Co., it may be given for this purpose. A full dose of Gregory's powder often cuts short an attack of **mucous diarrhoea** or **dysentery**, if given at the onset. Many praise it in **piles**, and consider it more effective if slowly chewed.

RHŒADOS PETALA. Red Poppy PetalsN.O. *Papaveraceæ***Syn. I. V.**—*Lâl posta*, Beng. *Rakta-posta*, Sans.**Source.**—The fresh petals of *Papaver rhæas*.**Characters.**—Bright scarlet, transversely elliptical, about 2 in. broad. Odour characteristic and taste slightly bitter.**Composition.**—(1) *Rhæadic* and *Papaveric acid*, said to be the colouring principles. A non-poisonous principle. (2) *Rhæadine*. No morphine.

OFFICIAL PREPARATION

1. **Syrupus Rhœados.**—1 in 3½. **B.P. Dose.**—½ to 1 dr.

USES

The syrup is sometimes used to allay cough in children, but the chief use of the petals is as a colouring agent.

RICINI OLEUM. Castor OilN.O. *Euphorbiaceæ***Syn. I. V.**—*Bherândâ Tel*, Beng. *Arand Tel*, *Rendi Tel*, Hind.**Habitat.**—India, chiefly cultivated in Bengal, Madras, and Bombay.**Source.**—The oil expressed from the seeds of *Ricinus communis*.**Characters.**—Viscid, colourless, or faintly yellow. Odour faint, taste bland at first, acrid and unpleasant afterwards. Sp. gr. 0.950 to 0.970**Solubility.**—1 in 5 of alcohol (90 p.c.), entirely in absolute alcohol, ether, and oil of turpentine. **Impurities.**—Oil of the inferior castor oil seeds, cotton seed oil, *Mohua oil*, and other fixed oils.

There are several varieties of oil, but the oil expressed by Mitchell's process without heat, known as "cold-drawn," should be used for medicinal purposes.

Characters of the seeds.—Oval, compressed, shining, marbled with reddish-brown or blackish-brown spots or stripes. Kernel white, albuminous, enclosing a large dicotyledonous leaf.**Resembles.**—Croton oil seeds (*see* p. 374).**Composition.**—Chemistry is not yet complete. (1) *Glyceryl Ricinoleate*, (2) *Ricinine*, an alkaloid, not purgative. (3) *Ricinoleic acid*, believed to be the purgative principle. (4) *Ricin*, an albuminoid poisonous body to whose presence is attributed the fact that three seeds prove fatal to an adult man. (5) Palmitin, stearin, resin, &c.**Action.**—Purgative.**B.P. Dose.**—1 to 8 drs. daily; 1 dr. for a child 1 year old.**Enters into.**—Colloid. Flex., Lint. Sinapis Co., Pil. Hyd. Sub. Co., and the

OFFICIAL PREPARATION

1. **Mistura Olei Ricini.**—3 drs. in 1 oz. B.P. has wisely dispensed with saponification. Is now emulsified. Purgative. **B.P. Dose.**—1 to 2 ozs. as a draught.

NON-OFFICIAL PREPARATIONS

1. **Capsules of Castor Oil**.—30 or 60 ms. in each flexible capsule.
2. **Enema Olei Ricini, B.P.C.**—Castor oil 2 ozs., Mucilage of Starch to 1 pint.

PHARMACOLOGY

Externally.—Like almond oil and olive oil, it is **bland** and **unirritating**. Rubbed into the skin, or injected into a vein or the rectum, it purges. It is said to **increase the secretion of milk** when applied to the breasts, but poultices of the leaves of the castor oil plant are more effectual.

Internally. **Gastro-intestinal tract.**—Its local action on the stomach is the same as on the skin, unless it is rancid, when it causes nausea, eructations and vomiting. In the duodenum pancreatic juice decomposes it, setting free *ricinoleic acid*, believed to be its purgative principle. It gently stimulates intestinal glands and peristalsis, and is a painless, speedy, certain and fairly **mild purgative**, operating within 4 to 6 hours. The stools are two to four in number, soft or semi-liquid, but not watery, the oil being expelled with the last ones and occasionally creating griping. A portion of the oil is no doubt absorbed, and when excreted by the mammary gland it may cause purgation to suckling babies. Some patients get habituated to its use, and in others it sets up after-constipation like rhubarb. It is therefore unsuitable in habitual constipation.

THERAPEUTICS

Externally.—It may be used like olive or almond oil. A drop of castor oil let fall on the conjunctiva **allays irritation** caused by a **foreign body**. It is employed as a basis of many hair-oils and pomades. It has been found sometimes to allay pain, and remove the stiffness of chronic articular rheumatism.

Internally.—It is the safest and **best purgative for children**, the old and **infirm**, delicate females, women during and after **pregnancy**, and persons subject to piles and fissure of the anus. In **abdominal operations**, **pelvic diseases**, **peritonitis**, **fevers**, especially in the constipation of typhoid fever, and **before or after a dose of santonin**, castor oil is the safest purgative to be used. **Diarrhoea**, infantile or otherwise, caused by indigestible or undigested food, yields to a dose of castor oil with or without a minute dose of Tr. Opii. It is an excellent remedy for **acute dysentery**, when given with opium which prevents griping, at the very onset (Castor oil 2 to 4 drs. and Tr. Opii 10 to 20 ms.). Similarly in small doses (15 to 20 ms. with 5 to 10 ms. of Tr. Opii emulsified) it is serviceable in the **chronic variety**. As an **enema** it has been given with success in impaction of the large intestine and rectum.

Dosage and mode of administration.—The writer has seen that a minimum dose of 30 ms. and a maximum dose of 8 ozs. were required

to open the bowels of an adult. As a rule he never uses more than 4 to 6 drs. for a single dose to an adult. Children can bear sometimes large doses. A small teaspoonful is not a large dose for a new-born babe. The cold-drawn castor oil is almost tasteless and can be given in the same way as cod-liver oil (*see* p. 503). However, the disagreeable smell and greasy and sickening taste can be very well covered by emulsification with mucilage of acacia, as in *Mist. Olei Ricini*, or with yolk of eggs, or by giving in capsules. The oil must be warmed in cold weather, before administration. Taken floating on hot coffee, or half a tea-cup of warm water drunk two hours after a dose of the oil, often helps its operation. Food retards or delays its action. It is said that a few drops of oil of turpentine mixed with the oil increases its purgative effect.

ROSÆ GALLICÆ PETALA

Red-Rose Petals. N.O. *Rosaceæ*

Syn. I.V.—*Golúp ful*, Beng. *Gulúp ka pápri*, Hind.

Habitat.—Britain and France.

Source.—The fresh and dried unexpanded petals of *Rosa gallica*, from cultivated plants.

Characters.—Little cone-like masses, or separate, purplish-red, velvety petals. Odour fragrant, rose-like. Taste bitter, feebly acid and astringent.

Composition.—(1) *Oil of Rose* (*off.*). (2) *Tannic* and *Galic acids*.

Action.—Astringent. Used for colouring.

OFFICIAL PREPARATIONS

1. **Confectio Rosæ Gallicæ.**—1 in 4. A soft violet-coloured mass. Used as an excipient for pills.

2. **Infusum Rosæ Acidum.**—1 in 40 ($\frac{1}{4}$ hour). Bright red. Astringent. **B.P. Dose.**— $\frac{1}{2}$ to 1 oz.

3. **Syrupus Rosæ.**—1 in 17 $\frac{1}{2}$. Red. Used for colouring. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.

ROSÆ OLEUM. Oil of Rose

Syn. B.P.—Otto of Rose.

Source.—The oil distilled from the fresh flowers of *Rosa damascena*.

Characters.—Pale yellow, crystalline, semi-solid; odour strong, fragrant of rose. Taste sweet. Sp. gr. 0.856 to 0.860.

OFFICIAL PREPARATIONS

1. **Aqua Rosæ.**—A saturated solution of the oil of rose, commercially prepared by distillation from Damask Rose. *Enters into.*—*Mist. Ferri Co* and rose basis for lozenges. *Dose.*—1 to 2 ozs.

2. **Unguentum Aquæ Rosæ.** *Syn.*—*Cold Cream, Unguentum Emollicius.*—7 in 19. A pleasant, fragrant, and emollient application.

ACTIONS AND USES

All preparations of rose are agreeable and fragrant vehicles. The infusion contains sulphuric acid, and is considered efficacious in

hæmoptysis, consumptive sweats and as a gargle in **relaxed sore throat**. Eye-washes are often made of rose water.

ROSMARINI OLEUM. Oil of Rosemary

N.O. *Labiata*

Habitat.—South of Europe and England.

Source.—The oil distilled from the flowering tops of *Rosmarinus officinalis*.

Characters.—Colourless or pale yellow; odour of rosemary; taste warm camphoraceous. Sp. gr. 0.900 to 0.915. **Solubility.**—2 in 1 of alcohol (90 p.c.).

Composition.—(1) *Terpene*. (2) *Steuropylene*. (3) *Camphor* ($C_{10}H_{16}O$) and *borneol* ($C_{10}H_{18}O$) in variable proportions. **Impurity.**—Oil of turpentine.

Action.—Rubefacient, stimulant, carminative.

B.P. Dose.— $\frac{1}{4}$ to 3 ms.

Enters into.—Lint. Saponis, Tr. Lavand. Co., and the

OFFICIAL PREPARATION

1. **Spiritus Rosmarini.**—1 in 10. **Dose.**—5 to 30 ms.

PHARMACOLOGY AND THERAPEUTICS

Externally.—It is a stimulant and rubefacient to the skin, and is commonly used in the form of hair oil or hair wash, to promote the growth of hair on the scalp in **baldness**. It is combined with liniments for its odour. Whittle recommends the following as a valuable application in baldness:—Olei Rosmarini $\bar{\text{v}}$ iv, Liq. Epispastici $\bar{\text{v}}$ ii, Ol. Amygdal. Dulc. $\bar{\text{z}}$ iss, Spt. Camph. $\bar{\text{z}}$ ii, Glycer. Borici $\bar{\text{z}}$ i, Ol. Rosæ $\bar{\text{M}}$ viii, Tr. Jaborandi $\bar{\text{z}}$ i, Mix. A little to be rubbed into the roots of the hair every night.

Internally.—It is a powerful stimulant, antispasmodic, and carminative, like aromatic oils. It is rarely used internally.

SACCHARUM LACTIS

Milk Sugar. $C_{12}H_{22}O_{11}$, H_2O

Syn. B.P.—Lactose.

Source.—A crystallized sugar obtained from the whey of milk.

Characters.—Crystals or a crystalline mass, greyish-white, hard, odourless, faintly sweet. **Solubility.**—1 in 7 of cold, and 1 in 1 of boiling water.

Enters into.—The preparation of Ext. Bellad. Alcohol., Ext. Nucis Vom., Ext. Opii, Ext. Physos., Ext. Strophanth., and Pulv. Elaterini Co.

NON-OFFICIAL AND ALLIED PREPARATIONS

1. **Human Milk, Artificial** (Frankland).—Heat $\frac{1}{2}$ pint of skimmed cow's milk to 90° F. and add rennet. After 10 to 15 minutes break up finely the curd thus formed and strain. After adding 110 grs. of milk sugar, boil the whey. Strain again, and mix it with $\frac{1}{2}$ pint of fresh cow's milk,

to which two spoonfuls of cream have been added. For older children, a third part only of the casein is to be removed.

2. **Koumiss or Kумыс, Artificial.**—True koumiss as prepared by the Tartars is a fermented mare's milk. Artificial koumiss may be brewed at home from cow's milk by any of the following processes. Dissolve grape sugar $\frac{1}{2}$ oz. in water 4 ozs. and yeast 20 grs. in cow's milk 4 ozs. Pour them into a quart bottle, and fill it up with milk. Cork and wire it well, and leave it in a cool place, with occasional shaking.

Pour fresh rich buttermilk (which remains after the butter has been separated by churning) 1 part, water 2 parts, cow's milk 8 parts into a loosely covered jar or bottle and keep it in a warm place, say near a fire, for 36 to 48 hours, with frequent brisk shaking. A slightly effervescing rather sharp-tasted fluid is the result. Its casein being partially digested by the fermentation of the sugar, Koumiss is an easily assimilable nutritious food and remedy, most invaluable in the *wasting diseases of the lungs*, in which case it can be taken *ad libitum*. It is borne by stomachs which refuse cod-liver oil. It is also very useful in *dyspepsia*, *infantile diarrhœa*, *kidney diseases*, and, in short, in any lingering disease.

3. **Kefir.**—Is a fermented milk like koumiss, the ferment being a Caucasian mushroom. It can also be made at home by kefir-ferment, which is a hard, yellowish-brown, granular body, collected from the vessels in which true kefir is made, and sold by druggists, or by adding a fungus which contains yeast and *Bacillus acidilactici*. Thus a sparkling beverage is obtained within 24 hours. Useful in *scrofula*, *anæmia*, *chest diseases* and *dyspepsia*.

4. **Sanose.**—A palatable, digestive, white, odourless powder, consisting of casein 8 and albumose 2, given with milk or soup. Somewhat similar preparations are sold under the name of **Eucasin**, **Protene**, and **Tropon**.

5. **Nutrose.** *Syn.*—**Sodium Caseinate.**—Colourless, odourless, almost tasteless soluble powder. Non-irritant and easily absorbed; given in *intestinal affections*. *Dose.*—1 to 4 teaspoonfuls.

6. **Plasmon.**—Soluble unaltered casein, containing the original organic salts, sold in various forms as biscuits, cocoa, &c. Possesses nutritive properties and is easily digested.

7. **Sanatogen.**—A similar preparation with the addition of sodium glycerophosphate.

8. **Somatose.**—Desiccated albumoses. Prepared either from milk or meat. Greatly assists *lactation* and when combined with iron as in **Ferro-Somatose** (*q.v.*) is useful in *chlorosis* and *anæmia*.

9. **Casumen.**—A soluble form of casein containing a very high percentage of proteid.

10. **Virogen.**—A concentrated food prepared from fresh sterilized milk. *Dose.*—1 teaspoonful.

11. **Albulactin.**—A soluble albuminous salt prepared from the albumin in milk. In the artificial feeding of infants albulactin added to cow's milk renders the curds exceedingly fine, improves milk digestion, and quickly increases the infant's nutrition.

12. **Dried Milk.**—As a food for infants dried milk has almost entirely superseded "humanized milk" at the Leicester infant's milk depot. It is the residue left after the natural moisture in milk has been evaporated. This is accomplished by passing the milk over a revolving heated cylinder. It will keep indefinitely in air-tight packages. When required for use boiled water is added to it.

PHARMACOLOGY AND THERAPEUTICS OF MILK SUGAR

Internally.—It greatly increases the flow of urine and is therefore given in **cardiac dropsy** and **albuminuria**. Because it does not ferment in the stomach it is the best sweetening agent in **infantile dyspepsia**, and **irritable conditions of the stomach**. It is considered to be a physiological **accelerator of labour pains**, and for this purpose doses of $5\frac{1}{2}$ to 7 drs. may be given, dissolved in half a pint of milk.

On account of its hardness it is used to facilitate the minute subdivision of other drugs, or to dilute potent substances and bring them up to a uniform standard.

SACCHARUM PURIFICATUM

Refined Sugar. $C_{12}H_{22}O_{11}$

Syn. B.P.—Sucrose. **Syn. I. V.**—*Misri, Chini*, Beng.

Source.—A crystallized sugar obtained from the juice of the sugar-cane.

Characters.—Well known.

Enters into.—All syrups and lozenges, 3 confections, some mixtures, powders, pills, Liq. Calcis Sacch., Sod. Citro-Tart. Efferves., Mag. Sulph. Efferves. and the

OFFICIAL PREPARATIONS

1. **Syrupus.**—2 of sugar and 1 water. *Enters into.*—Creosote mixture, Pill of Iron, 9 syrups, and Confec. Sulph.

2. **Syrupus Glucosi.** *Syn.*—*Glucosimide.*—As an excipient for pills.

ACTIONS AND USES

Internally.—Sugar is a food, and tends to produce fat, and to maintain body-heat. It is a **demulcent** and may therefore be given in irritant poisoning, but it is mostly used as a basis of various refrigerant beverages and sherbets. It is added to various pharmaceutical preparations to cover the disagreeable taste of drugs.

SALICINUM. See page 201

SALOL. See page 204

SAMBUCI FLORES. Elder Flowers

N.O. *Caprifoliaceæ*

Habitat.—Britain.

Source.—The flowers of *Sambucus nigra*, separated from the stalks.

Characters.—Small; calyx superior, five toothed; corolla flat, rotate, five-lobed, creamy white, with 5 stamens inserted in the tube; anthers yellow. Taste bitter. Odour not agreeable.

Composition.—(1) *Valerianic acid.* (2) *Resin.* (3) *Volatile oil.*

OFFICIAL PREPARATIONS

1. **Aqua Sambuci**.—1 in 1. Colourless. A fragrant basis for skin lotions.

USES

Elder flowers are believed to have no action except to perfume lotions. Elder-flower water is popularly used as a cosmetic and to remove freckles. It does not deserve to be retained in the B.P.

SANTALI OLEUM. Oil of Sandal-WoodN.O. *Santalaceæ*

Syn.—Oil of Santal-Wood, Oleum Santali Flavi, Yellow Santal Oil.

Syn. I. V.—*Chandaner tel*, Beng.

Source.—The oil distilled from the wood of *Santalum album*. Chips or raspings of heart-wood which contain the volatile oil, are used for distillation.

Characters.—Pale yellow, viscid, odour strongly aromatic, taste pungent, spicy. Sp. gr. 0.975 to 0.980. **Solubility.**—1 in 6 of alcohol (90 p.c.). **Impurities.**—Castor oil, cedar-wood and copaiba oils.

Composition.—The chief constituent is (1) *Santalol*, $C_{15}H_{26}O$, a mixture of sesquiterpene alcohols with different boiling points (94 to 98 p.c.). (2) Santalonic acid. (3) Esters, free acids, &c.

Action.—Like copaiba, anti-gonorrhœic.

B.P. Dose.—5 to 30 ms. in capsules and emulsion.

NON-OFFICIAL PREPARATIONS

1. **Capsules of oil of Sandal-Wood.**—5 to 10 ms. in each. Midy's capsules contain 5 ms. in each and most reliable. **Dose.**—10 to 12 capsules daily.

2. **Mistura Santali Co. B.P.C.** **Syn.**—*Nisbel's Specific*.—Ol. Santal 18 ms., Ol. Cassia 2 ms., Ol. Pimentæ $\frac{1}{2}$ m. in alcohol 1 dr. **Dose.**— $\frac{1}{2}$ to 1 dr. with milk or water.

3. **Liq. Santali Co. B.P.C.**—Ol. Santali 5, Sp. Cinnamomi 2.5, Tr. Buchu 17, Tr. Cubebs 15, alcohol *q.s.* to 100. **Dose.**—1 to 2 drs.

PHARMACOLOGY AND THERAPEUTICS

Externally.—Sandal-wood oil is used in perfumery. In India it is sometimes applied to scabies with good effects.

Internally.—Its actions closely resemble those of copaiba. It is absorbed and is eliminated by the kidneys, genito-urinary and bronchial mucous membranes, which it stimulates and disinfects, especially the former. Posner thinks that it has a specific action on the prostatic portion of the urethra. It is used with great benefit in 15 to 20 m. doses three times a day in acute and chronic gonorrhœa. When there is much burning, it is a good plan to give small doses (one or two capsules) every hour, to prevent the urine from irritating the mucous membrane. Being more pleasant, it can be given as a substitute for copaiba, but the combination of the two

has given splendid results in the writer's hands. It must be continued for two weeks, to prevent a recurrence, after the discharge has stopped. It has also been found serviceable in **chronic or foetid bronchitis** and **cystitis** in 10 m. doses. A very good *emulsion* may be made by mixing the oil with tragacanth powder and adding quickly water with stirring.

Sandal-Wood.—Its paste made by rubbing the wood on a rough stone mortar with a little water removes **prickly heat**, mild local **cutaneous inflammation**, such as occurs after vaccination, **frontal headache**, **pruritus**, &c., when locally applied. The decoction of the wood is considered as a diaphoretic and a vascular sedative (*Æ. Ross*).

SANTONINUM. Santonin. $C_{15}H_{18}O_3$

N.O. *Compositæ*

Source.—A crystalline principle prepared from *Santonica*, the dried unexpanded flower-heads or capitula of *Artemisia maritima*, var. *Stechmanniana*.

Characters.—Colourless, flat, rhombic prisms, feebly bitter, turning yellow by sunlight. **Solubility.**—Scarcely in cold, sparingly in boiling alcohol (90 p.c.).

Action.—A vermicide for round-worms.

B.P. Dose.—2 to 5 grs. ; $\frac{1}{2}$ to $\frac{1}{2}$ gr. for a child 1 year old. 1 to 2 grs. for a child 2 to 5 years.

OFFICIAL PREPARATION

1. **Trochiscus Santonini.**—1 gr. in each. *Dose.*—1 to 5.

NON-OFFICIAL PREPARATIONS AND DERIVATIVES

1. **Suppositorum Santonini.**—1 gr. in each. In *thread-worms* every second or third night 3 times.
2. **Santoninoxim.**—A santonin derivative in white crystalline powder. Less absorbable and non-toxic vermicide. *Dose.*—5 grs. or more, followed by a purgative ; given in 2 doses with an interval of 1 or 2 hours.
3. **Sodii Santonas.**—Colourless crystals, soluble in water, turning yellow on exposure to light. *Dose.*—5 to 10 grs. in milk or orange syrup.

PHARMACOLOGY

Internally. Intestines.—Santonin is a direct poison to round-worms, *Ascaris lumbricoides*, killing them in the intestine. Its action is less marked on thread-worms, *Oxyuris vermicularis*, and it has no effect whatever on tapeworms. Some authorities assert it does not kill but paralyzes the worms. It is the most valuable **anthelmintic** we have for the round entozoa. This anthelmintic action is possibly due to an unknown oxidation product of santonin formed in the intestine. Santonin does not kill these worms outside the body. In vermicial doses it does not purge, but does so when given in larger quantities.

Blood.—Some of the santonin is absorbed and circulates as sodium santonate.

Nervous system.—It produces some curious effects here. Even in medicinal doses, within an hour or two after administration, objects first appear bluish, and then greenish or yellow, due perhaps to a certain disturbance of the retinal fibres, for though there is hyperæmia of the retina, yet the humours and other tissues of the eye are not stained. Taste and smell are sometimes affected.

Kidneys.—Santonin is chiefly excreted by the kidneys, and during its passage, **increases their secretion.** Sometimes, it may create dysuria or incontinence of urine in children. It colours **acid urine greenish-yellow**, and **alkaline urine purplish-red**, referable probably to an unknown oxidation product formed in the system and excreted with the urine.

Generative organs.—Its alleged emmenagogue properties have not been verified.

Toxic action.—In large doses, it causes headache, vomiting, purging, loss of consciousness and speech, cold sweats, depression of the heart and respiration, intense saffron-coloured urine, tremor, convulsions and death. Sometimes a rash appears on the skin. Poisoning occurred in a child from $1\frac{1}{2}$ grs. On the other hand, recovery has taken place after swallowing 1 oz. of the drug. These poisonous symptoms have probably been due to impurities.

THERAPEUTICS

Internally.—Santonin is chiefly employed for killing round worms. It should be given at night on an empty stomach, after a mild purge in the morning, followed by a purgative next morning. Calomel is the best purgative to use. To a child 2 or 3 years old 1 to 2 grs. of santonin may safely be given followed by a purgative next morning. The writer always gives it with calomel and sugar, followed, if necessary, by a plain dose of calomel next morning. For **thread-worms**, it is best given in the form of an **enema** with castor oil. The suppository may answer as well, but thread-worms are best treated by the injection of an infusion of quassia or one of the simple bitters. Santoninoxim being non-poisonous can be used instead, without the risk of evil effects. Its use in **amenorrhœa**, **dysmenorrhœa**, **incontinence of urine**, **colour blindness**, **amaurosis**, **albuminuria**, &c., has not been attended with good results. Santonin (yellow) in doses of 5 grs. night and morning has been recommended in the treatment of **sprue**.

SAPO ANIMALIS. Curd Soap

Source.—Soap made with sodium hydroxide and purified animal fat, consisting principally of stearin; containing about 30 p.c. of water.

Characters.—White or greyish, dry, inodorous, horny, and pulverizable when kept in dry warm air. Moulded when heated. **Solubility.**—Soluble in alcohol (90 p.c.), sparingly in cold, but soluble in hot water.

Enters into.—Ext. Colocynth. Co., Lin. Pot. Iod. c. Sapon., Pil. Scammonii Co.

SAPO DURUS. Hard Soap

Syn.—Castile Soap, Olive Oil Soap.

Source.—Soap made with sodium hydroxide and olive oil, containing about 30 p.c. of water. It is an oleate of soda and is formed thus:—

$$(\text{C}_3\text{H}_5(\text{C}_{18}\text{H}_{33}\text{O}_2)_3 + 3\text{NaHO} = 3\text{NaC}_{18}\text{H}_{33}\text{O}_2 \text{ (hard soap)} + \text{C}_3\text{H}_5(\text{OH})_3 \text{ (glycerin)}.$$

Characters.—The same as above. **Impurities.**—Excess of alkaline hydroxide or carbonate.

Action.—Antacid, laxative. **Dose.**—5 to 15 grs. in pill.

Enters into. Emp. Resinae, Hyd. Oleas, Ung. Zinci, and 7 pill masses.

OFFICIAL PREPARATIONS

1. **Emplastrum Saponis.**—1 of soap in 7. White, solid. As a protective to bed-sores and for strapping.

2. **Pilula Saponis Composita.**—1 gr. of opium in 5. The name is used to disguise the composition. See p. 520.

SAPO MOLLIS. Soft Soap

Syn.—Green Soap.

Source.—Soap made with potassium hydroxide and olive oil.

Characters.—Yellowish-white or green, almost inodorous, of an unctuous consistence. **Solubility.**—Readily in alcohol (90 p.c.) and 1 in 4 of water.

Enters into.—Lint. Terebinth. and the

OFFICIAL PREPARATION

1. **Linimentum Saponis.** *Syn.*—*Opodeldoc.*—1 in 12. A stimulant local application to sprains, bruises, and stiff joints. **Enters into.**—Lint. opii.

NON-OFFICIAL PREPARATIONS

1. **Mollin.**—A soft soap containing 30 p.c. of glycerin and 17 p.c. of uncombined fat. A basis for ointments.

2. **Solutio Saponis Aetherea, B.P.C.** *Syn.*—*Ether Soap.*—Oleic acid 35, Caustic Potash q.s., Ol. Lavand. 20, Alcohol (90 p.c.) 15, Methylated Ether to 100. For surgical use prior to operations.

3. **Sodii Oleas.** *Syn.*—*Eunatrol.*—In cholelithiasis. **Dose.**—3 to 4 grs in pill.

4. **Liquid Glycerin Soap.**—Contains 40 p.c. of glycerin. For toilet use, and as a constituent of tooth pastes.

5. **Spiritus Saponis Kalini, B.P.C.**—Soft Soap 65, Spirit of Lavender 3, Alcohol q.s. to 100.

PHARMACOLOGY AND THERAPEUTICS

Externally.—Hard soap is a well-known **detergent**, but should not be used in any case where the skin is irritable, especially in acute or “weeping” forms of **eczema**. **Seborrhoea**, **scaly eczema**, **sycosis** and **ichthyosis** do well when the parts are washed with soft soap before any remedial agents are applied. The liniment rubbed in over **sprained** or **stiff joints** promotes the absorption of inflammatory products, but how far this effect is due to the friction or to the drug,

is difficult to say. Soap plaster is a non-irritant protective to **abrasions** or **bed sores**, and strapping is very useful in **sprains**, **fractures**, **synovitis**, **arthritis**, &c., by affording mechanical support and pressure. Soaps can be medicated with various drugs, such as carbolic acid, sulphur, tar, &c., in varying proportions. Mollin or superfatted soap is not irritant and may be used with success in many skin diseases and makes a good basis for ointments.

Internally.—Hard soap is **antacid**, and not being easily soluble may be used to **neutralize acid** in any part of the intestinal tract, which the soluble alkalis cannot reach. It aids the emulsification of foods in the duodenum, and restores some of the normal constituents of bile. It is itself a gentle **laxative**, and corrects and aids the action of certain purgatives, such as jalap and aloes. Introduced into the rectum in the form of a cone as a suppository, it purges by reflexly contracting the rectum and colon, and is very useful in **infantile constipation**. Soap and warm water make an effective enema for **constipation of adults**.

Hard soap is used in pharmacy as a corrigens and as a basis for pills and plasters, and the soft soap as a basis for some liniments.

SAPPAN. Sappan.

(*Ind. and Col. Addendum.*) N.O. *Leguminosæ*

Habitat.—India and Eastern Colonies.

Source.—The heart-wood of *Cæsalpinia sappan*.

Characters.—Hard, heavy sections, or orange-red chips, showing well-marked concentric rings and rays.

Composition.—(1) *Sapanin*, a crystalline principle allied to Hæmatoxylin.

OFFICIAL PREPARATION

1. **Decoctum Sappan.**—1 in 20. **B.P. Dose.**— $\frac{1}{2}$ to 2 ozs.

PHARMACOLOGY AND THERAPEUTICS

Formerly used as a dye and in the manufacture of red ink.

It contains tannin and is therefore employed in pharmacy to colour mixtures red, especially when an astringent is indicated.

SARSÆ RADIX. Sarsaparilla

N.O. *Liliacæ*

Habitat.—South America, Costa Rica.

Source.—The dried root of *Smilax ornata*, imported from Costa Rica, and commonly known as Jamaica Sarsaparilla.

Characters.—Long, nearly cylindrical, tough, flexible roots, greyish-brown, folded together and bound with a root of the same plant into bundles of 18 in. long, 4 or 5 in. in diameter. The root $\frac{1}{4}$ in. thick, deeply wrinkled longitudinally, with numerous rootlets. Transverse section

shows reddish-brown cortex and yellowish-white wood. Odourless. Taste bitter. *Impurities*.—Inferior varieties.

Resembles.—Senega, which is twisted and keeled. Hemidesmus, which is transversely cracked.

Composition.—(1) *Smilacin*, a neutral principle resembling saponin. (2) *Volatile Oil*. (3) *Resin, Starch, &c.*

Incompatibles.—Alkalies, which accelerate decomposition.

Action.—Alterative, diaphoretic, and diuretic.

OFFICIAL PREPARATIONS

1. *Extractum Sarsæ Liquidum*.—1 in 1. Coffee-brown. **B.P. Dose**.—2 to 4 drs.

2. *Liquor Sarsæ Compositus Concentratus*.—1 in 1. Dark brown. **B.P. Dose**.—2 to 8 drs.

* PHARMACOLOGY AND THERAPEUTICS

Internally.—The pharmacology of sarsaparilla is disputed. Some believe that it is diaphoretic, diuretic and alterative, while others say that it is quite inert. As it is always given in combination with potassium iodide and other drugs in *rheumatism, syphilis, scrofula*, &c., it is difficult to judge its virtues in those diseases. In India, it is still reckoned as a valuable alterative, and complex decoctions of sarsaparilla containing 50 to 60 ingredients are prescribed by *Hakims* and *Kavirajes*.

SASSAFRAS RADIX. Sassafras Root

N.O. *Laurineæ*

Habitat.—North America.

Source.—The dried root of *Sassafras officinale*.

Characters.—Large branched pieces, covered with bark. Bark rough greyish-brown externally; internally smooth, glistening, rusty brown. Odour aromatic; taste aromatic, astringent. Wood soft, light, greyish-yellow; odour and taste like bark.

Composition.—(1) *Volatile oil*, consisting of *safrol* (see below) 90 p.c. and *terpene* 10 p.c. (2) *Sassafrin*. (3) *Resin, Tannic acid, &c.*

Action.—Diaphoretic. A flavouring agent.

NON-OFFICIAL PREPARATION

1. *Safrol*.—Largely obtained from Japanese camphor oil. Externally, it acts like menthol. Internally, it is given in *rheumatism* and *sciatica*. *Dose*.—20 to 30 ms.

PHARMACOLOGY AND THERAPEUTICS

Internally.—The pharmacology of sassafras is unknown. It is said to possess slight **stimulant** and **diaphoretic** properties, on account of its volatile oil. It is generally used in combination with sarsaparilla and other drugs, as in *Liq. Sarsæ Compositus Concentratus*, and occasionally for its flavour.

SCAMMONIÆ RADIXScammony Root. N.O. *Convolvulaceæ***Habitat.**—Syria, Asia Minor, and some parts of India.**Source.**—The dried root of *Convolvulus scammonia*.**Characters.**—Brownish-grey, tapering or cylindrical, 1 to 3 in. or more in diameter, contorted, longitudinally furrowed. Crown enlarged, with remains of aerial stems. Fracture fibrous. Internally, colour light or dark grey. Odour characteristic. Taste at first sweetish, afterwards slightly acrid.**Resembles.**—Belladonna root, which is shorter.**Action.**—The juice of fresh root is a griping purgative.**SCAMMONIÆ RESINA.** Scammony Resin**Source.**—Prepared by making a tincture from the scammony root, with alcohol (90 p.c.), and by adding water to precipitate the resin; then by washing and drying.**Characters.**—Brownish translucent pieces, brittle. Fracture resinous. Odour sweet, fragrant. Does not form an emulsion with water. Soluble in alcohol and ether. **Impurities.**—Guaiacum resin which colours potato blue. Jalapin resin, insoluble in ether.**Action.**—Powerfully purgative.**B.P. Dose.**—3 to 8 grs. in pill or powder.**Enters into.**—Ext. Colocynth. Co., Pil. Colocynth. Co., Pil. Colocynth. et Hyos. and the

OFFICIAL PREPARATIONS

1. **Pilula Scammonii Composita.**—1 in 3 (nearly). Purgative. **B.P. Dose.**—4 to 8 grs.2. **Pulvis Scammonii Composita.**—1 in 2. Brown-coloured. Hydragogue purgative. **B.P. Dose.**—10 to 20 grs.; 1 to 2 grs. for an infant 1 year old.**SCAMMONIUM.** Scammony**Syn.**—Scammony Juice.**Syn. I. V.**—*Sakmunia*, *Sugmunia*, Hind.**Source.**—A gum-resin obtained by incision from the living root of *Convolvulus scammonia*, known in commerce as Virgin Scammony.**Characters.**—Flattened or irregular cakes, dark grey or blackish, covered with grey powder. Brittle. Fracture glossy, resinous, porous, dark-brown. Thin fragments brown, translucent. Reduced easily to ash-grey powder and emulsifies with water. Odour characteristic. Taste acrid.**Impurities.**—Starch, chalk, and resin prepared from the root.**Composition.**—(1) *Resin* (off.) 70 p.c. (2) *Scammonin*, identical with convolvulin, a glucoside. (3) *Gum*, scammonin is found in both gum-resin and resin.**B.P. Dose.**—5 to 10 grs.

PHARMACOLOGY

Internally. **Gastro-intestinal tract and liver.**—Scammony or scammony resin acts like jalap. Its action begins only when it mixes with the bile in the duodenum. It is the taurocholate and glycocholate of soda of the bile, that help its activity. It powerfully stimulates the secretion of the muscular coat, though the contraction is irregular. As a result, free purgation occurs with griping in about 4 hours; the stool being at first soft, but it soon becomes thin and watery. It is therefore a smart **hydragogue purgative**. It does not purge when injected into the blood, hence its action is entirely a local one. In large doses, it causes gastro-enteritis. It is used to complete the effect of other **vermifuges** for round- and tape-worms, and is a feeble **hepatic stimulant**.

THERAPEUTICS

Internally.—Scammony or scammony resin is rarely used alone on account of its griping qualities. By combining it with other purgatives, its own severity of action is mitigated, while the action of others is promoted. It acts promptly when given with an alkali; soap answering well. In **severe constipation** or **impaction of feces** the compound pill or powder can be given with advantage, care being taken that there is no gastro-intestinal irritation.

On account of its hydragogue properties it can be given in cases where depletion is necessary, as in **apoplexy** or **cerebral congestion** or where some effused fluid is to be absorbed, as in **dropsy**. Jalap answers better in such cases.

Though it is not a true **anthelmintic**, it can be used for the expulsion of intestinal worms, after a dose of **santonin**; its irritant purgative properties dislodging the *parasites* from the intestinal canal.

SCILLA. Squill. N.O. *Liliaceæ*

Habitat.—Mediterranean Coasts.

Source.—The bulb of *Urginea scilla*, divested of its dry membranous outer scales, cut into slices and dried.

Characters.—The slices of the inner scales are curved, tapering towards both ends, yellowish-white or pinkish, 1 to 2 in. long, translucent, pulverizable when dry, not when moist, inodorous, bitter.

Composition.—Two active principles:—(1) *Scillitoxin*. (2) *Scillipicrin*, both amorphous glucosides. (3) *Scillain*.

B.P. Dose.—1 to 3 grs.

OFFICIAL PREPARATIONS

1. **Acetum Scillæ.**— $\frac{1}{2}$ in 8. Filter through talc. **B.P. Dose.**—10 to 30 ms.

2. **Oxymel Scillæ.**—1 in 45. A thick, opalescent, brownish liquid. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr. as an expectorant.

3. *Pilula Scillæ Composita*.—1 in 4 (nearly). B.P. Dose.—4 to 8 grs.
4. *Pilula Ipecacuanhæ cum Scilla*.—See p. 520.
5. *Syrupus Scillæ*.—1 in 17 (nearly). A thick straw-coloured liquid. B.P. Dose.— $\frac{1}{2}$ to 1 dr. as an expectorant. 5 ms. for an infant 1 year old. *It should not be given with alkalis* as it contains acetic acid.
6. *Tinctura Scillæ*.—1 in 5. Straw-coloured. B.P. Dose.—5 to 15 ms.

PHARMACOLOGY

Internally.—Squill acts like digitalis (*q.v.* page 381) in many respects. The description of the latter will therefore apply to that of the former with the following distinguishing characteristics given below:—

1. Squill is a **more powerful gastro-intestinal irritant than digitalis**, causing nausea, vomiting, purging (even bloody stools), and intense inflammation of the membrane in full doses, and occasionally symptoms of indigestion in medicinal doses. The actions are due partly to its local and partly to its remote effects, for they can be produced when the drug is applied to an abraded surface, or injected into a vein, subcutaneous tissue or serous cavity.

2. It increases the vascularity and the secretion of the bronchial mucous membrane, due probably to the excretion of the active ingredients of the drug. It is therefore a powerful **expectorant**. Digitalis has no such action.

3. Squill is a **more powerful diuretic** than digitalis. It acts in two ways:—(a) Like digitalis it raises the blood-pressure, especially in the renal arteries. (b) The active ingredients being excreted by the kidneys, act as direct stimulants to the renal cells, and may cause considerable irritation of those organs.

THERAPEUTICS

Internally.—Squill can be given in cardiac and other forms of **dropsy**, because its action closely resembles that of digitalis; but its diuretic action is considerably increased, and its irritant properties are somewhat mitigated, when it is combined with digitalis. Even then, it is safe to occasionally suspend its administration for a while. Baly's or Guy's pill (*see* p. 386) is an excellent combination, and an efficient diuretic in **cardiac dropsy**. It is rarely prescribed alone and is contra-indicated in acute renal disease or if there be gastro-intestinal irritation.

As an expectorant, it should not be given in acute **bronchitis**, but **exclusively in its later stages**, especially when the pulse is soft and skin is moist. It also should not be used in **phthisis**, if the digestive powers are liable to be deranged. In the **chronic bronchial affections** of children, the oxymel or syrup is always serviceable in 10 to 15 m. doses, but its indiscriminate use in all varieties of bronchial affections is to be deprecated. Squill becomes doubly beneficial in **chronic catarrh** of dropsical patients.

It is never given as an emetic or purgative, though Whittle recom-

mends the syrup as an emetic in combination with ipecacuanha wine in 30 m. doses respectively, to a child one year old.

The active principles are powerful cardiac poisons.

SCOPARII CACUMINA. Broom Tops

N.O. *Leguminosæ*

Syn.—*Scoparius*.

Habitat.—Great Britain.

Source.—The fresh and dried tops of *Cytisus scoparius*.

Characters.—Stem dark green, with long, straight, alternate branches, which, like the stem, are winged, tough and flexible. The leaves if present are small, sessile and simple above, stalked and trifoliate below. Taste bitter and nauseous. Odour peculiar when bruised, if fresh. Odourless when dry.

Composition.—(1) *Scoparin*, a yellow crystalline neutral principle. (2) *Sparteine*, an oily, liquid, volatile alkaloid, which resembles digitalis in its action.

Action.—Diuretic.

OFFICIAL PREPARATIONS

1. **Infusum Scoparii.**—Made with *dried* tops. 1 in 10. **B.P. Dose.**—1 to 2 *ozs.*

2. **Succus Scoparii.**—Made with *fresh* tops. A brown juice. **B.P. Dose.**—1 to 2 *drs.*

NON-OFFICIAL PREPARATIONS

1. **Sparteine Sulphas, B.P.C.** Colourless crystals, soluble 3 in 2 of water. **Dose.**—1 to 2 *grs.*

2. **Oxysparteina.**—An oxidation product of sparteine, in white granular crystals, very soluble, forming strongly alkaline solutions. **Dose.**— $\frac{1}{2}$ to 1 $\frac{1}{2}$ *grs.*

3. **Oxysparteine Hydrochloridum.**—In transparent crystals, freely soluble in water. May be used hypodermically. **Dose.**— $\frac{1}{2}$ to 1 $\frac{1}{2}$ *grs.* daily.

PHARMACOLOGY AND THERAPEUTICS

Broom has no external action. As it contains two active principles, scoparine and sparteine, broom is a valuable **diuretic**. Sparteine increases the force of the heart like digitalis, and has been recommended for use where digitalis is contra-indicated but it is not so certain in its action. Broom is usually prescribed with other diuretics in all forms of **dropsy**, especially cardiac and **interstitial nephritis**. **Haustus Scoparii Compositus**, consisting of Pot. Tartras 20 *grs.*, Sp. Juniperis 30 *ms.* and Decoct. Scoparii ad 1 *oz.* is a very valuable combination, but it should never be prescribed for acute Bright's disease. Sparteine is said to be of value in cardiac failure, complicating **infantile diphtheria**.

SENEGÆ RADIX. Senega RootN.O. *Polygalææ***Habitat.**—North America.**Source.**—The dried root of *Polygala senega*.**Characters.**—Slender roots 2 to 4 in. long, of which the upper end is an irregular knotted tuberosity with remains of small stems, tapering below into a tortuous, wrinkled, keeled root, $\frac{1}{2}$ to $\frac{1}{2}$ in. thick. Bark yellowish or brownish-grey, transversely cracked. Fracture short. Odour distinctive; taste at first sweetish, afterwards acrid, causing a flow of saliva.**Resembles.**—*Arnica*, *Valerian*, *Serpentary*, and *Green Hellebore*, but these have no keels.**Composition.**—(1) *Senegin*, a glucoside, which is identical with *Saponin*, the active principle of *Quillaia bark*. It is a white powder, which forms a soapy emulsion when mixed with boiling water. It acts like *digitonin* (2) *Polygallic acid*.**Action.**—Stimulant expectorant.

OFFICIAL PREPARATIONS

1. **Infusum Senegæ.**—(1 in 20). B.P. Dose.— $\frac{1}{2}$ to 1 oz.
2. **Liquor Senegæ Concentratus.**—1 in 2. B.P. Dose.— $\frac{1}{2}$ to 1 dr.
3. **Tinctura Senegæ.**—Sherry coloured. 1 in 5. B.P. Dose.— $\frac{1}{2}$ to 1 dr.

PHARMACOLOGY

Externally.—Senega is an *irritant* to the skin.**Internally. Alimentary canal.**—In large doses it *irritates* the tract, producing salivation, vomiting, and diarrhoea; small doses cause indigestion.**Circulation.**—It is slowly absorbed and senegin circulates as such in the blood. It is a **cardiac depressant**, and removes the systolic standstill produced by digitalis. It arrests the heart in diastole. It is excreted by the skin, bronchial mucous membrane, and the kidneys.**Respiration.**—The powdered root, if inhaled, causes **sneezing** and cough. The action is chiefly directed to the bronchial tubes, through whose mucous membrane it is excreted. The bronchial mucous membrane is irritated by the excretion of senegin, which causes vascular dilatation, greater secretion, and reflexly, cough. Senega is therefore a **stimulating expectorant**.**Skin and kidneys.**—Senega is also excreted by these organs, and stimulates their actions moderately. Therefore it is a mild **diuretic** and **diaphoretic**.

THERAPEUTICS

The chief use of senega is as a **stimulating expectorant**. As it is an irritant to the bronchial mucous membrane, it must not be given in acute bronchitis, nor, on account of its gastro-intestinal action, when there is indigestion.

The indications for the use of senega are when the power to expectorate is small, but the quantity of matter to be expectorated is abnormally large, and it is more or less purulent in character as in the **second stage of bronchitis and pneumonia in the stage of resolution**. When the expectoration is tough and scanty, this remedy is useless. It is of value in **bronchiectasis** but should *not* be prescribed for the cough of **phthisis**. Some hold that senega sets up constant coughing by stimulating the respiratory centre or the efferent nerves, and thus empties the tubes and does not allow the mucus to accumulate. Farquharson believes that it acts as a tonic to the unstriated muscles of the bronchial tubes and thus aids in the expulsion of their contents. There is no doubt that the best effects are obtained when senega is combined with ammonium carbonate. According to Professor Schmiedeberg, senega is not the best member of the group of stimulating expectorants; quillaia is not only better but less nauseating and cheaper. It contains the same active principle (saponin) and in much larger proportion.

Under senega the pulsations of the heart become less frequent; it is therefore useful **when the heart is weak and dilated**. It has also been recommended to *relieve the distressing pulsations of aortic disease and counteract the effects of an overdose of digitalis*. As a diuretic, senega is weak and uncertain in its action, but it is said to be an excellent diaphoretic in **chronic rheumatism**.

It has lately been extolled as a remedy for **amenorrhœa**, for which purpose it is given in saturated decoction for two weeks before the expected period.

Senegin in 2 gr. doses has proved successful as a means of **arresting uterine hæmorrhage**.

Very small doses of senega (3 ms. to $\frac{1}{2}$ oz.) **emulsify fats and oils**, and the tincture may be used with advantage in *making the mistura olei ricini*.

SENNA ALEXANDRINA. Alexandrian Senna

N.O. *Leguminosæ*

Habitat.—Egypt.

Source.—The dried leaflets of *Cassia acutifolia*.

Characters.— $\frac{1}{2}$ to $1\frac{1}{2}$ in. long, $\frac{1}{4}$ to $\frac{1}{2}$ in. broad, lanceolate or oval-lanceolate, acute, *unequal at the base*, entire, thin, brittle, pale greyish-green. Surface finely pubescent, with distinct veins on the under surface. Odour faint, tea-like. Taste mucilaginous, unpleasant.

Resembles.—Leaves of *Uva Ursi* and *Buchu*; all of which equal at the base.

SENNA INDICA. East Indian Senna

Syn. B.P.—Tinnivelly Senna.

Habitat.—Southern India.

Source.—The dried leaflets of *Cassia angustifolia*.

Characters.—Usually varying from 1 to 2 in. in length, lanceolate, acute, *unequal at the base*, thin, entire, yellowish-green, smooth above

somewhat duller beneath. Glabrous or slightly pubescent. Odour and taste as above.

Composition of both kinds.—(1) *Cathartic acid*, an amorphous purgative glucoside. It exists as salts of earthy bases which are soluble in water. (2) Other glucosides, *sennacrol* and *sennapicrin*, soluble in water. (3) *Chrysophanic acid*, or dioxymethylanthraquinone. (4) *Emodin*, or trioxymethylanthraquinone. (5) A sugar, *catharto-mannite*.

Action.—Simple purgative.

OFFICIAL PREPARATIONS OF EITHER KIND

1. **Confectio Sennæ.** *Syn.*—*Lenitive Electuary*, B.P.C. **B.P. Dose.**—60 to 120 grs.
2. **Infusum Sennæ.**—1 to 10. **B.P. Dose.**— $\frac{1}{2}$ to 1 oz.; as a draught 2 ozs.
3. **Liquor Sennæ Concentratus.** **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.
4. **Mistura Sennæ Composita.** *Syn.*—*Black Draught*.—Contains Mag Sulph. $\frac{1}{2}$ oz. in 1 oz. **B.P. Dose.**—1 to 2 ozs.
5. **Pulvis Glycyrrhizæ Compositus.**—Senna is the most important ingredient (2 in 12). **B.P. Dose.**—60 to 120 grs.
6. **Syrupus Sennæ.**—1 in 2. **B.P. Dose.**— $\frac{1}{2}$ to 2 drs.
7. **Tinctura Sennæ Composita.**—1 in 5. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr. for repeated administration; 2 to 4 drs. for a single dose.

NON-OFFICIAL PREPARATIONS

1. **Elixir Sennæ, B.P.C.** *Syn.*—*Sweet Essence of Senna*. **Dose.**—1 to 3 drs.
2. **Extr. Sennæ Liquidum, B.P.C.**—This is most active and certain of senna preparations. **Dose.**— $\frac{1}{2}$ to 1 dr.

PHARMACOLOGY

Externally.—None.

Internally.—Senna is a **laxative** or brisk **purgative** according to the dose used. The cathartic acid in it stimulates both the secretion and peristaltic action of the intestines, especially the colon, and produces pale yellow watery stools, containing some undigested food. It is not a cholagogue. Large doses cause **griping**. It possesses none of the tonic effects of rhubarb; on the other hand, purgation by senna does not cause subsequent constipation. It may however cause the urine to be red. Injected into the veins, it causes vomiting and purging. It is eliminated with all the secretions and will purge the child when given to nursing women.

THERAPEUTICS

Senna is a safe purgative in slight cases of **simple constipation** and **fecal accumulation**, but, on account of its tendency to gripe and nauseous taste, it is rarely given alone.

It is largely used to *complete the effect of duodenal purgatives*, in the form of a blue pill at bedtime and black draught in the morning. To make the draught agreeable Ext. Glycyrrhizæ liq. may be added to it. The compound liquorice powder is to be preferred to the black

draught, as it is a very nasty mixture. This preparation is largely used in **habitual constipation** and the **constipation of pregnancy**. Confection of senna, either with or without sulphur, is a valuable laxative in **hæmorrhoidal conditions**, and when coated with chocolate forms the well-known **Tamar Indien**, which is so readily taken by children.

It is said that the infusion contains more cathartic acid than the other preparations. Combined with gentian, it is an admirable remedy for **dyspepsia with constipation**. The following was a favourite prescription of the late Dr. Abernethy—Inf. Gentianæ Co. 1 oz., Inf. Sennæ 4 drs., Tinct. Cardamomi Co. 1 dr.

Cathartic acid is often given and is a safe, mild purgative; rarely producing nausea or griping. It can be prescribed in combination with syrup of Virginian prune, which completely disguises the taste. The dose for an adult is 5 grains.

Prescribing hints.—Infusion of senna soon decomposes; this can be prevented by the addition of 1 grain of nitre to each ounce of the infusion. The griping property of the black draught may be prevented by adding a few ms. of Tr. Cardamomi Co.

SERPENTARIÆ RHIZOMA. Serpentry Rhizome

N.O. *Aristolochiaceæ*

Syn.—Virginian Snake root.

Habitat.—North America.

Source.—The dried rhizome and rootlets of *Aristolochia serpentaria* or of *Aristolochia reticulata*.

Characters.—Rhizome $\frac{1}{2}$ in. thick, 1 in. long. The upper surface bearing remains of aerial stems; and under surface, numerous wiry interlacing roots of about 3 inches long. Dull yellowish-brown. Odour aromatic, camphoraceous with a strong aromatic bitter taste.

Resembles.—*Valerian* and *Arnica*, but can be distinguished by the smell.

Composition.—(1) A bitter principle, *Aristolochin*. (2) A volatile oil. (3) Resin.

Action.—Bitter stomachic.

Enters into.—Tinctura Cinchonæ Composita.

OFFICIAL PREPARATIONS

1. **Infusum Serpentariæ.**—1 in 20. B.P. Dose.— $\frac{1}{2}$ to 1 oz.
2. **Liquor Serpentariæ Concentratus.** B.P. Dose.— $\frac{1}{2}$ to 2 drs.
3. **Tinctura Serpentariæ.**—1 in 5 (Alcohol 70 p.c.). B.P. Dose.— $\frac{1}{2}$ to 1 dr.

PHARMACOLOGY AND THERAPEUTICS

It is a **bitter stomachic** and **stimulant expectorant**; also said to be a **cardiac stimulant**, **diaphoretic** and **diuretic**. Small doses act like other bitter tonics; large ones irritate the gastro-intestinal tract throughout its extent, with production of much flatulence. It is chiefly used, as a vehicle for other drugs, in **bronchitis** and **typhoid**

fever. Said to be useful in the **amenorrhœa** of **anæmia** and **chlorosis**. Many properties are ascribed to it, but most of these are imaginary. It is strongly recommended by Garrod in **gout**, and is said to be a useful *substitute for guaiacum*, when people are unable to take that drug.

SESAMI OLEUM. Sesame Oil

(*Ind. and Col. Addendum.*) N.O. *Pedaliaceæ*

Syn.—Teel oil, Gingilli oil.

Habitat.—India, Eastern, African, and North American Colonies.

Source.—The oil expressed from the seeds of the *Sesamum indicum*.

Characters.—A pale yellow, limpid oil; faint odour, bland taste.

Composition.—(1) *Sesamin*. (2) *Glycerides of oleic and linoleic acids*.
(3) *Sesamol*, a phenol.

USES

Used as a *substitute for olive oil*, to make liniments, ointments and plasters.

SEVUM PRÆPARATUM

Prepared Suet. N.O. *Ruminantia*

Syn.—Mutton Suet.

Source.—The internal fat of the abdomen of the sheep, *Ovis aries*, purified by melting and straining.

Characters.—Well known.

Composition.—(1) *Olein*, 30 p.c. (2) *Palmitin*. (3) *Stearin*.

Action.—(a) Externally, emollient. (b) Internally, nutritive.

Enters into.—Unguentum Hydrargyri.

NON-OFFICIAL PREPARATION

1. **Sevum Phosphoratum, B.P.C.**—10 p.c. Used as a concentrated fatty basis for the preparation of many of the compound phosphorus pills.
Dose.— $\frac{1}{16}$ to $\frac{1}{2}$ gr.

SINAPIS. Mustard

Source.—Black and white mustard seeds powdered and mixed.

Characters.—A greenish-yellow powder, with an acrid, bitter, and pungent taste; inodorous when dry, but exhaling when moist a characteristic pungent odour. *Impurities.*—Starch and flour.

Action.—Counter-irritant, emetic.

OFFICIAL PREPARATION

1. **Charta Sinapis.**—Mustard powder, after the *fixed* oil has been extracted with benzol, is mixed with Liquor Caoutchouc and spread on cartridge paper.

SINAPIS ALBÆ SEMINA. White Mustard Seeds

N.O. *Cruciferae*

Syn. I. V.—*Dhop-rai*, Beng. *Sufed-rai*, Hind.

Source.—The dried ripe seeds of *Brassica alba*.

Characters.—The seeds about $\frac{1}{16}$ in. diameter, $\frac{1}{16}$ gr. in weight. Roundish, pale yellow, very finely pitted and reticulated testa. Externally hard; internally yellow, oily. Inodorous when entire or powdered, taste pungent.

Composition.—(1) A bland fixed oil. (2) *Sinabin* and *Myrosin*. *Myrosin* converts *sinabin* into a fixed pungent body called *acrinyl isothiocyanate*, *glucose*, and *sinapin acid sulphate*, in presence of water.

SINAPIS NIGRÆ SEMINA. Black Mustard Seeds

Syn. I. V.—*Rai-sarisha*, Beng. *Makra-rai*, Hind.

Source.—The dried ripe seeds of *Brassica nigra*.

Characters.—Scarcely half the size of white mustard seeds and dark reddish or greyish-brown in colour, internally yellow.

Composition.—(1) The same fixed oil. (2) *Sinigrin* and *Myrosin*. On the addition of water, the latter converts *sinigrin* into the official volatile oil of mustard (which is *allyl isothiocyanate*), *dextrose*, and *potassium acid sulphate*.

OLEUM SINAPIS VOLATILE

Volatile oil of Mustard

Source.—The volatile oil distilled from *black* mustard seeds after maceration with water.

Characters.—Colourless or pale yellow, intensely pungent and irritant with an acrid taste. Sp. gr. 1.018 to 1.030. **Solubility.**—1 in 50 of water readily in spirit and in ether.

Composition.—95 p.c. of *Allyl isothiocyanate*.

OFFICIAL PREPARATION

1. **Linimentum Sinapis.**—Contains 4 p.c. of volatile oil. 1 in 27.

NON-OFFICIAL PREPARATIONS

1. **Spiritus Sinapis.**—Volatile oil 1, alcohol (90 p.c.) 49.
2. **Thiosinamin, B.P.C.** *Syn.*—*Rhodallin.*—Formed by warming oil of mustard with alcoholic solution of ammonia. Soluble in water, alcohol, and ether. 15 to 20 p.c. solution, used hypodermically for *lupus* and *urine affection*. *Dose.*— $\frac{1}{4}$ gr. increased to 1½ grs. Use with caution.
3. **Fibrolysin.**—Consists of thiosinamin and sodium salicylate in solution. *Dose.*—2.4 c.c. = 40 ms. hypodermically or intramuscularly.

PHARMACOLOGY

Externally.—Mustard is a powerful local irritant, rubefacient, and vesicant. When it is first applied, there is a sensation of warmth followed by severe burning pain, due to the irritant action of the mustard on the sensory nerves and increased local blood-supply. This irritation is quickly followed by paralysis, as a result of which there is loss of sensibility, and a diminution both of the pain produced by the mustard and of any that may have existed previously. Mustard is also a counter-irritant. The excitation of the sensory nerves may reflexly stimulate the cardiac and respiratory

centres and sometimes may be used to restore consciousness after fainting.

Internally. **Gastro-intestinal tract.**—Taken in small doses as a **condiment**, mustard causes a sense of warmth in the stomach, stimulates the secretion of gastric juice and peristalsis, and therefore sharpens the appetite. In larger doses, it acts as a prompt and efficient *emetic*, without causing any of the usual depression.

THERAPEUTICS

Externally.—A linseed poultice, having a little mustard (1 in 16) dusted over it, is a very common and efficacious **irritant** and *counter-irritant* in **rheumatism, pleurisy, pneumonia, bronchitis**, and many **febrile diseases** (see page 486).

A pure mustard plaster, when applied to the skin, will soothe pain in **gastralgia, colic, neuralgia, lumbago, &c.** When put over the epigastrium it often **relieves vomiting**, and when applied to the calves of the legs, it is an excellent reflex stimulant in cases of **syncope, asphyxia** and **coma**.

Severe headache, common colds, and febrile conditions, especially in children, are greatly relieved by a hot **pediluvium**, or foot-bath, whilst **infantile convulsions** may constantly be checked by immersion of the whole of the patient's body in a mustard bath, containing one tablespoonful of mustard to each gallon of water.

A mustard **sitz bath** (*i.e.* hip bath) may be taken at the time of the period to induce **menstruation**, when it has been suppressed by a chill.

Internally.—As an **emetic**, mustard is specially valuable in narcotic poisoning on account of its reflex stimulant effects. Give one to four teaspoonfuls in a tumbler of warm water.

Most contradictory reports are published as to the benefits to be derived from the hypodermic or intramuscular injections of thiosinamin or fibrolysin in troubles brought about by the presence of scar tissue. The advocates of its use maintain that in cases of stricture, &c., it will soften the substance of which that stricture is composed, thus rendering it more amenable to ordinary treatment by dilatation. Hence they advocate its hypodermic administration for prolonged periods in **stricture of the œsophagus, stenosis of pylorus, perigastric adhesions, hour-glass contraction of the stomach, urethral stricture, middle ear deafness, Dupuytren's contraction, &c.** On the other hand other observers report no improvement as the result of numerous injections long continued. The whole question is at present *sub judice*. The injections have in some cases recently recorded been followed by the onset of **purpura hæmorrhagica**, which is rather a dangerous complication for conditions which left to themselves are not likely to prove fatal. In our hands it has not proved of much use.

SODIUM. Sodium. Na

Source.—The metal sodium as met with in commerce. It decomposes water and must therefore be kept under naphtha in stoppered bottles.

Characters.—Well known.

Enters into.—Liquor Sodii Ethylatis.

NON-OFFICIAL PREPARATION

1. **Pasta Londinensis.**—Caustic soda and unslaked lime, equal parts. Less painful than Vienna Paste (*see* p. 572).

TOXICOLOGY OF THE CAUSTIC ALKALIS

Persons are not often poisoned by the caustic alkalies, but accidents occasionally happen through their swallowing by mistake either *pearlash*, which is a mixture of potassium carbonate and potash, or *soups-lees*, which contain the corresponding sodium salts.

The symptoms are a caustic taste in the mouth and burning heat in the throat, the mucous membrane of which becomes swollen, soft, and red. This is followed by pain in the stomach, vomiting, diarrhoea, feebleness of the pulse, and general collapse. On post-mortem examination, the whole mucous membrane from the mouth to the stomach is found red, swollen and excoriated.

Treatment.—Any rapidly acting emetic, or hypodermic injection of apomorphine. If no emetics available, give copious draughts of warm water and tickle back of throat with a feather. After vomiting has occurred give (1) **feeble acids** (*e.g.* vinegar, lime-juice, dilute acetic or citric acid); (2) **demulcents** (oil, linseed tea, white of egg).

N.B.—Do not wash out the stomach with the stomach-pump as there is danger of damaging the softened mucous membrane.

SODA TARTARATA

Tartarated Soda. $\text{KNaC}_4\text{H}_4\text{O}_6, 4\text{H}_2\text{O}$

Syn. B.P.—Sodium Potassium Tartrate.

Syn. Commercial.—Rochelle Salt, Seignette's Salt.

Source.—Add acid potassium tartrate to a hot solution of sodium carbonate, and allow to crystallize out.

Characters.—Large, colourless, transparent, crystalline prisms, with a saltish taste. *Solubility.*—1 in 6 of cold water. *Impurity.*—Acid potassium tartrate.

Action.—Diuretic, purgative. **B.P. Dose.**—120 to 140 grs.

OFFICIAL PREPARATION

1 **Pulvis Sodæ Tartaratæ Effervescens.** *Syn.*—Seidlitz Powder. *Dose.*—Dissolve the contents of the blue paper in half a pint of water, add contents of white paper, and drink during effervescence.

SODII CITRO-TARTRAS EFFERVESCENS

Effervescent Sodium Citro-Tartrate

Source.—Sugar 15 ozs., Sodium Bicarbonate 51 ozs., Citric Acid 18 ozs., Tartaric Acid 27 ozs. Heat till the mixture assumes a granular form.

B.P. Dose.—60 to 120 grs., freely diluted.

SODII SULPHAS. Sodium Sulphate

Syn.—Glauber's Salt. "Sal Mirabile."

Source.—The interaction of sulphuric acid with various sodium salts.

Characters.—Colourless, transparent, efflorescent prisms, which undergo watery fusion when heated. Neutral. Taste saline. **Solubility.**—1 in 3 of cold water. **Impurities.**—Iron and Ammonia salts.

Action.—Saline purgative, cholagogue.

B.P. Dose.—30 to 120 grs. for repeated administration, or one dose of $\frac{1}{2}$ to $\frac{1}{2}$ oz.

OFFICIAL PREPARATION

1. **Sodii Sulphas Effervescens.** **B.P. Dose.**—60 to 120 grs., or one dose of $\frac{1}{2}$ to $\frac{1}{2}$ oz., freely diluted.

NON-OFFICIAL PREPARATIONS

1. **Sodii Persulphas.**—Small white granular crystals, soluble in water. Recommended to stimulate appetite in *tuberculosis*. Useful in *dyspepsia with hyperacidity*, and in *gastric cancer*. **Dose.**—1 to 3 grs. in water, before meals.

2. **Sodii Sulphas Acidus.** **Syn.**—Sodium Bisulphate.—To purify water which has been contaminated by typhoid stools. Fifteen grains to a pint of water will destroy *Bacillus typhosus* in 15 minutes.

3. **Sodii Sulphas Exsiccatus.**—The anhydrous salt, much more convenient for dispensing, especially in powders. **Dose.**— $\frac{1}{2}$ to 2 drs.

4. **Sodio-Magnesi Sulphas Effervescens.**—Introduced by Martindale as a substitute for *Hunyadi János* and *Pullna waters*. **Dose.**—A teaspoonful, or more, taken in half a tumbler of water half an hour before breakfast.

5. **Chloro-Sodio-Magnesian Aperient.**—A similar preparation, but contains some sodium chloride. Resembles *Friedrichshall Water*. Useful in *migraine*. **Dose.**—A teaspoonful.

6. **Pulvis Sal Carolini Factitii, B.P.C.**—*Artificial Carlsbad Salt.*—Dried Sodium Sulphate 44, Potassium Sulphate 2, Sodium Chloride 18, Sodium Bicarbonate 36. **Dose.**—30 to 60 grs. in warm water. 53 grs. to 1 pint of water resembles *Carlsbad Water*.

7. **Pulvis Salis Carolini Factitii Effervescens, B.P.C.**—Dried Sodium Sulphate 9, Gluside .05, Sodium Pot. Tartrate 38, Sodium Chloride 3, Sodium Bicarbonate 33, Tartaric Acid to 100. Dry separately, then mix. **Dose.**—60 to 120 grs. Resembles *Kutnow's Powder*.

PHARMACOLOGY OF SODIUM SULPHATE, CITRO-TARTRATE
AND TARTARATED SODA

Internally. Intestines.—Sodium salts are absorbed much more slowly than the corresponding ones of potassium: consequently they pass on into the intestines, where they act as **saline purgatives**, causing a soft painless motion two or three hours after administration. Sodium sulphate is the most active of the three; it is also a **cholagogue**. There are three theories as to the manner in which these

saline purgatives produce loose motions :—(1) That a quantity of water, corresponding to the endosmotic equivalent of the salt, is attracted from the blood through the intestinal wall, and that this water forms the greater part of the loose motion. (2) That the secretions of the glands of both the large and small intestines are strongly stimulated by these salts. (3) That the peristaltic movements of the intestines are accelerated by these foreign bodies, and that consequently the chyme reaches the rectum sooner and in a less digested condition. The truth of the matter seems to be that saline purgatives produce a true secretion chiefly from the small intestines. This secretion is not a product of osmosis, but the result of irritation by the salts, the low diffusibility of which prevents its re-absorption. The peristaltic action is also somewhat increased.

Blood and Kidneys.—They render the blood and urine more alkaline, but in this respect act more feebly than potassium salts. Sodium sulphate has undoubtedly some effect on metabolism, and experiments on rabbits have shown that it causes an increase of 10 to 15 p.c. in the consumption of oxygen for several hours. Injected into the blood, these salts have no purgative effect.

THERAPEUTICS

Internally. **Intestines.**—These salts are extremely valuable in the treatment of **chronic constipation**, especially when associated with **gout, congestion of the liver or uric-acid diathesis**. They should always be taken freely diluted in warm water, first thing on rising in the morning when the stomach is empty. As sodium sulphate is a cholagogue, it should be selected whenever there is **disease of the liver**, or in cases of **gall-stones**. It is also useful in certain forms of **dysentery**. It is the active principle of *Carlsbad, Marienbad, Tarasp, and Condal* waters; and it occurs in **combination with magnesium sulphate** in *Aesculap, Hunyadi János, Pullna, Rubinat, Apenta, and Kissingen* waters. *Friedrichshall* water contains **sodium chloride**, in addition to the above mentioned. Directions for making imitations of these waters have been given under the head of “non-official preparations.” In large doses, these salts produce copious watery stools, and are used to remove dropsical accumulations, especially when due to **cirrhosis of the liver**.

SODII BICARBONAS

Sodium Bicarbonate. NaHCO_3

Source.—See preparation of potassium bicarbonate.

Characters.—In dry white powder of small monoclinic crystals with a saline taste. Slightly alkaline. Soluble 1 in 11 of cold water. *Impurities.*—The carbonate. Twenty grains neutralize 16·7 grains of citric acid or 17·8 grains of tartaric acid.

Incompatibles.—Acids and acid salts, e.g. bismuth subnitrate.

B.P. Dose.—5 to 30 grs.

OFFICIAL PREPARATION

1. **Trochiscus Sodii Bicarbonatis**.—(Rose basis) 3 grs. in each.

PHARMACOLOGY

The same as that of the potassium salt, except that it is much more slowly absorbed, that it causes less gastro-intestinal irritation, and like all sodium salts is only feebly depressant.

THERAPEUTICS

Externally.—A lotion (7 grs. to 1 oz.) is employed as a sedative. to **relieve itching**. The powder, either applied dry or made into a paste, has a magical effect in relieving the pain of **burns** or **scalds**, but it must be applied immediately. As a mouth-wash, it **relieves toothache** and protects the teeth from the corrosive action of acid medicines. The wash also cures headache depending on the irritation of the teeth.

Internally.—In **frontal headache without constipation**, where the pain is just at the junction of the forehead with the hairy scalp, sodium bicarbonate given before meals often affords relief. (N.B. If the pain is just above the eyebrows, give dilute nitro-muriatic acid after meals, and if there be constipation, give magnesium sulphate.) Very useful in **stomach cough**, due to irritation of the gastric terminations of the vagus. Give 1 dr. in a tumblerful of water and order to be slowly sipped. It is very valuable as a remedy for **dyspepsia**, especially that form due to *Butyric acid fermentation*, the symptoms of which are pain at the pit of the stomach coming on between meals, and relieved by food, heartburn, acid eructations, flatulence, and constipation. For this purpose give before meals, and combine with bismuth and a simple bitter. It then acts in the following ways:— (1) It has a *sedative action on the gastric nerves*. (2) It *liquefies tenacious mucus*. (3) It *promotes the secretion of the acid gastric juice*, which destroys the *Bacillus butyricus*. (4) It *combines with the hydrochloric acid of the gastric juice*, with the formation of carbonic acid and sodium chloride. The former assists in absorption from the intestines, and the latter promotes the digestion of albumens. In **duodenal ulcer** with excessive pain Brunton recommends bicarbonate of soda, one teaspoonful dissolved in a tumbler of lime water. It plays an important part in the treatment of **diabetes**, many patients being sent to drink the waters of Vichy (sodium carbonate) or Carlsbad (sodium sulphate and carbonate). In threatened **diabetic coma**, dissolve 300 grains of bicarbonate of sodium in one pint of milk and let it be drunk during the twenty-four hours. If coma is well marked, transfuse it into the cellular tissue of the breast or axilla, or throw it up the rectum. In a severe case, the patient ought to get 500 grains of sodium bicarbonate in the day. It **loosens the bronchial secretion**, but less so than the corresponding potassium salt. It is

of no value in **uric-acid diathesis**, as urate of sodium is less soluble than urate of potassium.

Prescribing hints.—Remember that you must always prescribe the carbonate of bismuth with bicarbonate of sodium and not the subnitrate, which will liberate carbonic acid and cause the cork to fly out of the bottle. For children, combine with a grain of rhubarb and sugar. If sodium bicarbonate is given simply for the purpose of neutralizing excess of acid in the stomach, then exhibit it after meals.

SODII CARBONAS. Sodium Carbonate



Syn.—Soda or Washing Soda.

Source.—From sodium chloride either by interaction with ammonium bicarbonate or by its conversion into sodium sulphate and the action of heat on a mixture of the sulphate with carbon and calcium carbonate.

Characters.—Transparent, colourless, rhombic crystals, efflorescent. Taste caustic. Soluble 1 in 2 of cold water. *Twenty grains neutralize 9.8 grains of citric acid, or 10.5 grains of tartaric acid.* **Impurities.**—Sulphates and Chlorides.

B.P. Dose.—5 to 30 grs.

Enters into.—Extractum Ergotæ.

SODII CARBONAS EXSICCATUS

Exsiccated Sodium Carbonate

Source.—Sodium carbonate deprived of its water of crystallization by gently heating.

Characters.—A dry white powder, nearly anhydrous.

Enters into.—Pil. Ferri (carbonate of iron is formed).

B.P. Dose.—3 to 10 grs.

PHARMACOLOGY AND THERAPEUTICS

These resemble those of potash, except that they are less caustic.

SODII CHLORIDUM. Sodium Chloride



Syn.—Common salt.

Source.—Occurs native.

Characters.—Well known. **Solubility.**—1 in 2½ of cold water. **Dose.**—10 to 240 grs.

PHARMACOLOGY

Sodium chloride is a very important constituent of many mineral waters. How it acts in the system is not clearly known, but the following facts have been ascertained. It **accelerates osmosis** in the tissues, thus **increasing the albuminous waste** and consequently the **amount of urea excreted** from the system. To

eliminate this salt a greater quantity of water is required in the urine ; consequently sodium chloride acts as a **diuretic**. This water is abstracted from other organs, and therefore common salt **promotes thirst**. It also **increases the production of lymph** in the tissues and promotes its circulation. Outside the body it **increases the action of ptyalin, trypsin, and pepsin** ; whilst in the stomach it promotes the secretion of pepsin, and **expedites absorption**.

It is an **indispensable article of diet** with all vegetarians, especially those whose food contains large quantities of potassium salts, but it does not appear to be required by meat-eaters. This is probably due to the fact that the blood-plasma contained in the interstices of the meat supplies all the sodium chloride that is necessary. Bunge has an ingenious theory that the potassium salts in vegetable food combine with the sodium chloride of the blood, thus rendering it useless and causing its elimination from the body. This appears rather far-fetched, and the true explanation is probably that given above. If salt be withheld from the diet, general weakness, **anæmia**, and dropsy ensue. In large doses, common salt is a prompt **emetic**. Injected into the rectum, it kills **Oxyuris vermicularis** or thread-worm.

THERAPEUTICS

Externally.—Cold douching with salt and water is a very valuable remedy in all forms of **muscular weakness**, especially in the *weak back* of growing girls, and in **lateral curvature of the spine**.

Sea-bathing is a **mild general stimulant**. If the patient is unable to proceed to the seaside, *Tidman's sea salt* or, in India, ordinary rock salt, is an efficient substitute. One pound of salt to three gallons of water is the proper proportion. At Droitwich and Nantwich concentrated hot salt baths are largely used for **chronic rheumatism, sciatica, and joint diseases**, in which conditions they give great relief. Recently injections of sea water subcutaneously into the buttocks have been recommended by French physicians, for the treatment of **dyspepsia, wasting, chronic skin affections** in adults, and for **gastritis and entero-colitis** in infants. The water has to be collected in sterilized bottles at a depth of 20 ft. and several miles from shore. It is used fresh and unboiled.

Sixty grains of common salt in one pint of water constitutes **normal saline solution**, which may be injected either into the veins or the rectum or the loose connective tissue under the axilla or breast, in various conditions of collapse and unconsciousness. By this method of treatment many lives have been saved in **uræmia, eclampsia** and in the **shock following severe operations and post-partum hæmorrhage**.

It is also useful in the **second stage of cholera** and in **diabetic coma** but, in these cases, the benefit is only temporary. It may

however revive the patient sufficiently to enable him to settle his worldly affairs, and should therefore never be omitted.

Recently this treatment for cholera has been revived in a modified form by Leonard Rogers. Instead of *isotonic* infusion he gives *hypertonic* saline solution according to the formula, Sodium chloride 120 grs., Pot. chloride 6 grs., Calcium chloride 4 grs., sterilized water 1 pt., of this four pints are given intravenously. The theory on which it is based is that when the isotonic saline is used the fluids of the blood pass into the tissues and are rapidly drained off into the intestines, causing a resumption of the vomiting and diarrhoea. But when the blood is rendered hypertonic by the injection of Rogers' strong salt solution it rapidly regains its normal composition, i.e. it again becomes *isotonic*, but this is accomplished by osmotic attraction draining lymph from the tissues. This increases the volume of the blood and this increased volume of blood will in its turn tend to augment the flow of lymph, urine and sweat. Further, the employment of massive saline subcutaneous transfusion has revolutionized the treatment and outlook of **suppurative peritonitis**. Formerly practically condemned to death, a large number now recover even in desperate cases. As much as fifteen pints in twenty-four hours are syphoned into the subcutaneous tissues of the thighs. The theory of this treatment is that patients with peritonitis lose water but cannot replace it. This loss the transfusion speedily makes good. With a depleted vascular system fluid from the collections of pus in the peritoneum passes into the surrounding vessels. These massive infusions tend to start a flow in the opposite direction, thus preventing absorption of toxins. Again the transfusion dilutes the toxins circulating in the blood and diminishes the virulence of their action on the nervous tissues, &c., and the infusion with the diluted toxins is excreted by the kidneys with the least possible damage to the renal epithelium.

Note.—The restriction of salt (salt-free diet) in the case of epileptics taking bromides, rapid absorption of bromide salts results.

Jenning's formula for normal saline solution is rather more elaborate; as follows:—Sodium chloride 50 grs., potassium chloride 3 grs., sodium sulphate $2\frac{1}{2}$ grs., sodium phosphate 2 grs. Dissolve in 1 pint of water, and add alcohol (90 p.c.) 2 drs. This formula is made by Burroughs and Wellcome in their *Soloid Sodii Chloridi Comp.* Two Tabloids are required for one pint of normal saline solution.

Sodium chloride also is an important constituent in the following artificial serums:—

1. *Trunecek's Inorganic Serum.*—Sodium sulphate 14, Sodium chloride 4.9, Sodium phosphate 15, Sodium carbonate 21, Potassium sulphate 40, water to 100. This is used for nervous ailments and in cases of high arterial tension. It is administered subcutaneously in doses of 1 c.c., gradually increasing by 0.2 c.c.

2. *De Renzi's Iodized Ser. n.*—Sodium chloride 6, Iodine 1

Potassium Iodide 3, Sterile water 1000. It is used in surgical tuberculosis, and the dose is from 100 to 300 c.c. per diem.

Internally.—Cold salt and water is an excellent gargle for chronic relaxed throat. It is a prompt and efficient emetic, and it may be injected into the rectum either for the cure of thread-worms, or for the relief of obstinate constipation in children. In doses of one drachm given every second or fourth hour it has distinct expectorant qualities. It is an antidote in poisoning by silver nitrate, which it converts into the insoluble chloride. It is also useful in cases where a leech has been swallowed or has got up the nose.

Dried salt, with three times the amount of elm-bark and a little hyoscyamus may be applied to the os uteri in subinvolution, when it relieves congestion in the same way as a glycerin plug.

Betz has given it in internal hæmorrhages with marked benefit. He dissolves one drachm in half a pint of water, and administers three tablespoonfuls every five minutes. In hæmoptysis, half a teaspoonful of the undissolved salt may be given in one dose and repeated occasionally till it excites nausea. Nothnagel, and other observers, report cures of epilepsy and migraine by one drachm doses.

LIQUOR SODII ETHYLATIS

Solution of Sodium Ethylate. C_2H_5ONa

Source.—By dissolving 22 grains of sodium in 1 oz. of absolute alcohol Contains 8 p.c. of sodium ethylate. Sp. gr. 0.867.

Characters.—A syrupy liquid, colourless when fresh, turning brown on keeping.

Dispensing hint.—Always prepare as required.

PHARMACOLOGY AND THERAPEUTICS

The most manageable and effective of all our caustics, except solidified carbon dioxide. Used as a depilatory, and to destroy warts, moles, and nævi. Several cases of lupus have been cured by its use. Apply lightly with a pointed glass rod for 2 or 3 successive days till a scab forms. When this falls off, repeat the treatment, if necessary. Permit no water to touch the part. The application causes little or no pain. If pain results, allow a drop of chloroform to fall upon the spot; this converts the sodium ethylate into ether and sodium chloride, and stops all caustic action.

SODII NITRIS. Sodium Nitrite



Source.—Prepared by heating sodium nitrate with lead.

Characters.—White, deliquescent, crystalline granules, or in sticks. Taste cooling, saline. *Solubility.*—2 in 3 water.

B.P. Dose.—1 to 2 grs.

PHARMACOLOGY AND THERAPEUTICS

Possesses similar properties to amyl nitrite and nitroglycerin (which see) but it is slower in its action than the former and does not cause so much throbbing and headache as the latter. Useful in **angina pectoris**, **aortic disease**, and in the increased arterial tension which accompanies **granular kidney**. Lubinski has used it with marked success in **hemicrania**, and in **asthmatic affections** of purely bronchial and neurotic origin.

For asthma, it should be given in doses of 3 to 5 grains, frequently repeated, and it is specially useful when combined with hyoscyamus.

SODII PHOSPHAS. Sodium Phosphate



Syn.—Hydric-di-sodic phosphate. *Tasteless Purging Salt.*

Source.—Prepared by digesting bone-ash with sulphuric acid, then filtering to remove calcium sulphate, and finally adding sodium carbonate to the solution.

Characters.—Transparent, colourless, efflorescent, rhombic prisms. **Solubility.**—1 in 6 of cold water. **Impurity.**—Calcium phosphate.

Action.—Aperient, cholagogue, diuretic, antirheumatic, nervine tonic.

B.P. Dose.—30 to 120 grs. for repeated administration, or one dose of $\frac{1}{2}$ to $\frac{1}{2}$ oz.

OFFICIAL PREPARATION

1. **Sodii Phosphas Effervescens.**—Prepared as the other effervescing preparations. **B.P. Dose.**—60 to 120 grs., or one dose of $\frac{1}{2}$ to $\frac{1}{2}$ oz. in 3 to 6 ozs. of water.

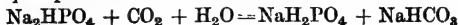
NON-OFFICIAL PREPARATION

1. **Sodii Phosphas Exsiccatus.**—Mixes with other powders without deliquescing. **Dose.**—10 grs. in warm liquid.

PHARMACOLOGY

Internally. **Gastro-intestinal tract.**—In small doses it is **antacid**, and in larger doses it is a **mild aperient** and **cholagogue**. It is a **powerful hepatic stimulant** to the dog.

Blood.—It is a constituent of normal human blood, and therein can combine with or give off carbonic acid, becoming converted into monosodic phosphate and vice versa, thus:—



Kidneys.—It increases the excretion of uric acid, and is a **diuretic**.

THERAPEUTICS

Sodium phosphate is practically tasteless; it is therefore very suitable as a **mild aperient** well suited for a **delicate stomach**, and for **administration to children**. Useful in **bilious sick-headache** and **jaundice**. It has been recommended for **hepatic**

calculi, in doses of 60 grs. three times a day, and if gastro-intestinal catarrh be present, small doses of sodium arsenate (one twentieth of a grain) may be added.

SODII SULPHIS. Sodium Sulphite



Source.—Prepared by passing sulphurous acid gas through a solution of sodium carbonate.

Characters.—Colourless transparent prisms. *Solubility.*—1 in 4 of water.

B.P. Dose.—5 to 20 grs.

PHARMACOLOGY AND THERAPEUTICS

Externally.—The solution (1 in 8) has been used in the treatment of various **parasitic skin diseases**.

Internally.—It is decomposed in the stomach, giving off sulphurous anhydride, and is therefore used in fermentative diseases of that organ characterised by the presence of **sarcinæ** and **torulæ**.

It is a **very feeble antiseptic**, and is not of much value in medicine.

SODII CHLORAS. B.P.C.

Sodium Chlorate (*Non-official*)

Source.—Prepared in the same way as the corresponding potassium salt.

Characters.—Large, regular, modified tetrahedric crystals, colourless. Taste saline, mawkish but not disagreeable. Fuses and deflagrates when exposed to a red heat. *Solubility.*—1 in 1 of water, 1 in 100 of alcohol. *Dose.*—10 to 30 grs.

PHARMACOLOGY AND THERAPEUTICS

This salt is to be preferred for many purposes for which potassium chlorate is used, especially in **stomatitis with ulceration along the edge of the gums**. Doses of 2 to 4 drachms daily have given great relief in **gastric cancer**.

SODII CINNAMAS. B.P.C.

Sodium Cinnamate (*Non-official*)

Syn.—Hetol.

Characters.—Transparent micaceous crystals. *Solubility.*—1 in 11 of distilled water or normal saline solution.

Action.—Leucocyte-stimulant. *Dose.*—2 to 5 grs., by the mouth or hypodermically.

NON-OFFICIAL PREPARATIONS

1. **Glycerinum Sodii Cinnamatis, B.P.C.**—Hetol 5 and sterilized glycerin 95. *Dose.*—45 to 90 ms. hypodermically,

N.B.—In preparing this solution the temperature must not be raised above 180° C., otherwise *acrolein* will be produced which would be very irritating. Used in *tuberculosis* and *cancer*.

2. **Heto - Kresol.** *Syn.* — *Cinnamyl - metakresol.* — A white crystalline powder insoluble in water or glycerin, slightly soluble in alcohol, but very soluble in ether. As a local application to *tuberculous ulcers*.

3. **Strontium Cinnamate, B.P.C.**—A white powder, soluble 1 in 100 of water, and 1 in 50 of equal parts of glycerin and water. Used for the same purposes as *Hetol*. *Dose.*—2 to 5 grs.

4. **Sodium Phenyl-Propiolate.** *Syn.*—*Therminol.*—Used as a spray for the treatment of *tubercular laryngitis*. At first the strength should be $\frac{1}{2}$ p.c., but it can be gradually increased from week to week to 3 p.c. It is to be inhaled twice a day for half an hour at a time.

5. **Sodium Ortho-Coumarate.**—A very soluble, stable salt, which produces well marked and rapid leucocytosis.

6. **Sodium Para-Coumarate.**—Less soluble, with a similar, though less intense, action.

7. **Sodium Meta-Coumarate.**—Apparently even more active than the ortho-salt.

PHARMACOLOGY AND THERAPEUTICS OF THE CINNAMATES AND COUMARATES

Much work has recently been done on this subject by Drage, Morgan and others, who have shown that the sodium salts of these acids, when injected either hypodermically or intravenously, are powerful leucocyte-stimulants and it is urged that on this account they are valuable remedies in the treatment of **tuberculosis** and **cancer**. Morgan has shown that not only sodium cinnamate (*Hetol*) but also sodium phenyl-propiolate (*Therminol*) cause a marked leucocytosis, whilst the recent experiments of Charteris and Cathcart have demonstrated that this leucocytosis, which consists almost entirely in an increase in the mononuclear elements, is not due to stimulation of the bone marrow, though the spleen shows slight evidence of stimulation.

Both the above-mentioned acids contain an unsaturated carbon chain attached to a Benzene nucleus (C_6H_5), the former acid having a treble linking, and the latter a double one, whereas Benzoic acid which does not contain an unsaturated group is physiologically far less active. The relationship between these three substances is shown by the formulæ given below.

Benzoic acid	.	.	C_6H_5-COOH
Phenyl-propionic acid	.	.	$C_6H_5-C\equiv C-COOH$
Cinnamic acid	.	.	$C_6H_5-CH=CH-COOH$

It is presumed therefore that the physiological activity of the phenyl-propiolates and cinnamates is due to their unsaturated carbon atoms. Drage's original observations on the use of the cinnamates in the treatment of cancer were made with the *Glycerinum Sodii Cinnamatis*, but a demand quickly arose for a drug having a more potent action and of greater solubility. Morgan therefore endeavoured

to discover some method of enhancing the physiological activity of cinnamic acid. He argued that as the therapeutic value of the Benzene derivatives depends upon the presence of either an amino—(NH_2) or a hydroxy—(OH) group, it seemed likely that a substituted cinnamic acid containing one of these groups might have the desired effect. Since the employment of amino-compounds of the antifebrin type is apt to be followed by unpleasant after-effects, he tried a hydroxy-derivative in the shape of sodium ortho-coumarate, a substance having the structure of cinnamic acid with a hydroxyl substituent, and standing in the same relation to salicylic acid that cinnamic acid does to Benzoic acid, as is shown by the formulae given below :—

Benzoic acid	.	.	$\text{C}_6\text{H}_5.\text{COOH}$
Cinnamic acid	.	.	$\text{C}_6\text{H}_5.\text{CH}.\text{CH}.\text{COOH}$
Salicylic acid	.	.	$\text{C}_6\text{H}_4.\text{OH}.\text{COOH}$
Ortho-coumaric acid	.	.	$\text{C}_6\text{H}_4.\text{OH}.\text{CH}.\text{CH}.\text{COOH}$

He therefore experimented with a 22 p.c. aqueous solution of sodium ortho-coumarate. This solution is limpid and very stable, and as the salt is very soluble even stronger concentrations may be used. It is found to produce a marked leucocytosis fully equal to that of sodium cinnamate, over which salt its greater solubility gives it a distinct advantage. Experiments have also been made with the para- and meta-coumarates; the latter is apparently the most active of the three isomers, but further experiments are required to show which of them is likely to prove to be the most serviceable therapeutic agent.

For the treatment of **inoperable cancer** Drage recommends the *hypodermic injection* twice a week of either 30 ms. of the 10 p.c. glycerin solution of the cinnamate, or 25 ms. of the 22 p.c. aqueous solution of the ortho-coumarate. He claims that by this method he can prolong life, relieve pain and distressing symptoms, cause appreciable diminution in the size of the growth, and lessen the foetus of the discharges, so that the patient dies quietly of exhaustion and not with the old horrors of sepsis.

For the treatment of **phthisis** Brum recommends the *intravenous injection* of Hetol, beginning with $\frac{1}{2}$ gr. and gradually increasing the dose to 10 or 15 times the amount. This treatment may be combined with the use of the Thermiol spray (*v. supra*). The writer has recently been trying the effect of these preparations in selected cases of **cachexial fever**, due to the Leishman-Donovan parasite, and has in several instances observed marked benefit, but he is not yet able to say how far the improvement is a permanent one.

SODII CITRAS. B.P.C.

Sodium Citrate. (*Non-official*)

Characters.—Small granular crystals, resembling common salt.

Dose.—10 to 60 gra.

PHARMACOLOGY AND THERAPEUTICS

May be given as a **refrigerant**, in preference to potassium citrate. Useful in **azoturia**, diminishing both the polyuria and the nitrogenous excretion. May also be added to milk at the time of administration, in the proportion of 2 to 5 grs. to each ounce of milk. It then prevents the formation of large lumps of curd and makes the milk more easy of digestion. The citrate of sodium is now largely used in the **curd indigestion** of hand-fed infants. How it acts is not certain; practically the fact remains that milk which was rejected before is digested when sodium citrate is added to it. From 2 to 4 grains are generally added to each bottle. Unlike barley water it does not cause flatulence, but constipation may result from its use. Given in too large doses (edema may be caused which quickly disappears on withholding the drug. Messrs. Burroughs and Wellcome put it up in tabloids to suit all ages.

SODII HIPPURAS. B.P.C. *Non-official*

A white, amorphous powder, readily soluble in water.

Recommended in **gout, gravel, and calculus**, as a solvent of urates. If the urine of the patient be abnormally acid, add an alkaline citrate. *Dose*.—5 to 30 grs.

SODII PERMANGANAS (See p. 584)**SODII PEROXIDUM. B.P.C.**

Sodium Dioxide (*Non-official*)

A white, amorphous, deliquescent powder. Dissolves in water with production of heat and evolution of oxygen.

One part with 8 of ice forms a bleaching and antiseptic solution, used by dentists in **tooth-stopping**. Unna recommends the use of an anhydrous soap containing 10 to 20 p.c. of sodium dioxide, and made into a paste with liquid paraffin, in the treatment of **acne**.

SODIUM SILICATE, Solution of (*Non-official*)

Syn.—*Soluble glass, Water-glass.*

A viscid, treacly solution containing 10 p.c. of caustic soda, and 20 p.c. of silica. Has a remarkable power in arresting the putrefaction of organic matter. Used as an injection in **ozæna, leucorrhœa, gonorrhœa, cystitis, and uterine ulceration**. Must be freely diluted.

SODII SULPHOCARBOLAS

Sodium Sulphocarbolate. Sodium Phenol-para-sulphonate



Source.—Obtained by dissolving phenol in excess of sulphuric acid, and converting phenol-sulphonic acid into a sodium salt.

Characters.—Colourless, transparent, rhombic prisms with a saline bitter taste. *Solubility*.—1 in 6 of water, 1 in 150 of alcohol (90 p.c.).

B.P. Dose.—5 to 15 grs.

ACTIONS AND USES

Antiseptic and antipyretic. In **diphtheria**, **cholera**, **septic fevers**, **tympanites**, &c. It is used in preference to carbolic acid. Twenty grain doses, alternately with 1 gr. of quinine, every 2 hours, have been found of value in **chorea**.

SODII SULPHO-ICHTHYOLAS

Sodium Sulpho-Ichthyolato (*Non-official*)

Syn.—*Sodium Ichthyol Sulphonate.*

Source.—Prepared from a bituminous quartz found in the Tyrol, consisting of fish and animal remains. It is first treated with sulphuric acid and then neutralized with soda. Ammonium, lithia, and zinc sulpho-ichthyolates are prepared in the same way. The best known is the ammonium salt, to which the name of **Ichthyol** has been given.

Characters.—All of them are viscous, brownish, almost black substances, with a disagreeable tarry odour. They contain a considerable amount of sulphur (15 p.c. in Ichthyol), which exists partly in direct combination with carbon (as in mercaptan), and partly in close combination with oxygen, so that the whole is soluble and absorbable. *Solubility.*—Soluble in water, oils, fat, glycerin, and vaseline.

Action.—Antiparasitic, antiseptic, local anæsthetic, resolvent.

Dose (for all four salts).—10 to 30 grs.

NON-OFFICIAL PREPARATIONS

1. **Ichthyol Collodion.**—1 in 7. For *eczema* and *erysipelas*.
2. **Salve mulls**, containing 10 grammes of ichthyol in $\frac{1}{2}$ sq. metre.
3. **Salve Ichthyol.**—10 to 30 p.c. in equal parts of alcohol and ether.
4. **Suppositoriæ Ichthyol.**—3 grs. in each. *Add 1 gr. of beeswax to give firmness to the oil of theobroma.*
5. **Unguentum Ichthyol.**—20 to 50 p.c., with lanoline, or olive oil and lard.
6. **Unguentum Ichthyol Compositum, G.H.**—Ichthyol 1, lime water 9 lanoline 5, vaseline 10, zinc ointment 5.
7. **Pasta Ichthyol, B.P.C.**—Starch 40, water 20, ichthyol 40, strong solution of albumen 1. To be painted on the skin. Quickly dries and is easily washed off. Recommended by Unna for *acne rosacea*.
8. **Ichthalbin.**—A combination of ichthyol and albumen. A tasteless, odourless brown powder. In *eczema* and *nervous intestinal affections*, and during *convalescence from fevers*. **Dose.**— $\frac{1}{2}$ to 15 grs.
9. **Ichthargan.** *Syn.*—*Silver Thio-hydrocarbu-sulphonate.* (See p. 254.)
10. **Petrosulfol.**—Resembles ichthyol, but prepared from a pitch containing sulphur. For *boils*, *chilblains*, *eczema*, and *impetigo*.
11. **Thiol.**—A mixture of sulphonized hydrocarbons, prepared by heating gas-oil with sulphur. Exists in two forms (a) **thiol siccum**, a black powder, or in laminae; (b) **thiol liquidum**, a syrupy liquid containing 40 p.c. of the latter. A substitute for ichthyol. **Dose.**—(Of dry) 2 to 10 grs.
12. **Anytin.**—Contains 33 p.c. of *Ichthyol-sulphonic acid*. Possesses the property of rendering substances like phenol readily soluble in water.

These compounds are called **Anytols**, e.g. *Meta-cresol-anytol* (**Metasol**) contains 40 p.c. of meta-cresol; *Eucalyptol-anytol* (**Eucasol**) contains 12½ p.c. of eucalyptol. These solutions are used as antiseptics.

13. **Thigenol**.—A black viscid liquid. The sodium salt of an organic sulphuric acid. Contains 10 p.c. of sulphur. For *skin diseases*.

14. **Sphagnol**.—A decomposition product of peaty deposits. Used in *blepharitis, burns, &c.*, and as a detergent in cases of *insect bites*.

15. **Isarol**.—A preparation similar to Ichthyol.

16. **Tumenol**.—A sulphonized mineral oil, in the form of a brown mass. Used as a dusting powder in *eczema, lupus, &c.*

PHARMACOLOGY AND THERAPEUTICS OF SULPHO-ICHTHYOLATES

Ichthyol, which will be taken as the type, was introduced by Unna in 1882 as a remedy for chronic skin diseases: since then it has been found to possess the following virtues (1) it is an **antiseptic**, and kills most disease germs, (2) it is a **local anæsthetic**, (3) it **contracts the small vessels**, (4) it **promotes the absorption of exudations**, (5) it **increases the body-weight and improves the general health**, and (6) it **saturates the system with sulphur**, thus possessing all the good properties of that drug (which see). It is free from toxic properties, and ten times the ordinary dose may be taken without ill effects. It is valuable in all diseases where there is **capillary engorgement**, and it is reported to have given good results in **chronic rheumatism, pleural effusions, syphilis, asthma, chlorosis, scrofula, phthisis, catarrhs of the various mucous membranes**, and in various **neuralgias and uterine disorders**.

A 3 p.c. injection is valuable in **gonorrhœa**, and a 30 p.c. solution is recommended for **prurigo senilis**. Externally the 30 p.c. ointment is employed for **wounds and burns of the first and second degree**, when it relieves pain at once and slight burns heal rapidly. A 50 p.c. ointment gives excellent results in **erysipelas**, and the collodion may be used for the same purpose. The ointment, in varying strengths, is also useful in **eczema, acne, psoriasis, herpes, erythema, boils, carbuncles, ringworm and favus**.

The ichthyol paste is an elegant application for **acne rosacea**, whilst the solution in ether and alcohol gives immediate and permanent relief in **erythema nodosum**. As a suppository, in combination with conium, it will be found a very soothing application in **hæmorrhoids and fissure of the anus**. Ichthalbin is insoluble in the stomach and only splits up in the duodenum. It is intended for internal use only. Four parts are equivalent to three of ichthyol.

Thiol siccum makes a very good dusting powder in **herpes and burns**. The following is an excellent formula:—Thiol 1, starch 1, zinc oxide 2, talc 16. Or a solution (1 in 4), or ointment (1 in 3) may be used. Solutions of ichthargan and the various anytols are powerful antiseptics, and metasol has an energetic action on **diphtheritic processes**.

Prescribing hints.—The odour of ichthyol may be disguised with oil of citronella, which is itself used in Ceylon for rheumatism.

SODII TAUROCHOLAS. B.P.C. (*Non-official*)

A white amorphous powder prepared from pig's bile. Recommended for **gouty obesity and dyspepsia**. *Dose*.—2 to 6 grs., in keratin-coated pill.

SODII TELLURAS. Sodium Tellurate

(*Non-official*)

A valuable remedy for checking the **night-sweats of phthisis**. Should be given in doses of one-third to two-thirds of a grain in pill daily. Imparts the characteristic tellurium smell to the breath, and may cause diarrhoea if the lungs be extensively diseased.

SODÆ CHLORINATÆ LIQUOR. *See* page 332.

SODII ARSENAS. *See* page 172.

SODII BENZOAS. *See* page 275.

SODII BROMIDUM. *See* page 285.

SODII CACODYLAS. *See* page 177.

SODII HYPOPHOSPHIS. *See* page 550

SODII IODIDUM. *See* page 466.

SODII SALICYLAS. *See* page 199.

STAPHISAGRIÆ SEMINA

Stavesacre Seeds. N.O. *Ranunculaceæ*

Habitat.—England.

Source.—The dried ripe seeds of *Delphinium staphisagria*.

Characters.—Irregularly triangular, arched on one side, blackish-brown, with wrinkled and pitted testa. Smell none. Taste bitter, acrid.

Composition.—Two alkaloids: (1) *Staphisagrine*, a powerful respiratory poison resembling Curare. (2) *Delphinine*, which resembles Aconitine and Veratrine in its action. (3) A *fixed oil*.

Action.—Parasiticide.

OFFICIAL PREPARATION

1. **Unguentum Staphisagriæ.**—1 in 5. Heat with the lard on a water bath for two hours.

PHARMACOLOGY AND THERAPEUTICS

The ointment has been employed externally in **neuralgias**, and internally the drug has been given in **asthma**, **rheumatism**, and **dropsies**; but it is never used nowadays except as a **parasiticide to kill pediculi**.

The ointment acts most satisfactorily in destroying **lice in the head**, but when used for **body-lice** it should be also rubbed into the garments which are worn next the skin, as this is where the parasite lives. The ointment is said to be perfectly safe but it should

be used with caution as it contains at least two poisonous alkaloids, and the student should bear in mind that there are other parasiticoïdes which are equally effectual and less dangerous.

STRAMONII FOLIA

Stramonium Leaves. N.O. *Solanaceæ*

Habitat.—England.

Source.—The dried leaves, collected whilst the plants are in flower, of *Datura stramonium*, the thorn-apple.

Characters.—Greyish-green, ovate, petiolate, 4 to 6 in. long, unequal at the base, with dentate margin and acuminate apex. Taste saline and bitter. The leaves are minutely wrinkled.

Identification.—Belladonna and hyoscyamus leaves resemble stramonium but the former are less wrinkled and the latter are hairy.

Incompatibles.—Caustic alkalis, metallic salts, and mineral acids.

Composition.—An alkaloid, *Daturine*, which is identical with hyoscyamine and isomeric with atropine. It exists as a malate.

Action.—Narcotic, antispasmodic, deliriant.

OFFICIAL PREPARATION

1. **Tinctura Stramonii.**—Percolate. 1 in 5. B.P. Dose.—5 to 15 ms.

STRAMONII SEMINA. Stramonium Seeds

Source.—The dried seeds of the above-mentioned plant.

Characters.—Small, reniform, pitted and wrinkled, flattened, brownish-black. Taste bitter.

Composition.—As of the leaves, but the proportion of alkaloids is more constant.

OFFICIAL PREPARATION

1. **Extractum Stramonii.**—Alcoholic. B.P. Dose.— $\frac{1}{4}$ to 1 gr.

PHARMACOLOGY AND THERAPEUTICS

Internally.—Its action resembles that of belladonna, but it has a much more powerful effect in relaxing the muscular coat of the bronchial tubes, and it may cause irregularity of the heart's action. It is rarely used except for the relief of the paroxysms of **asthma**, for which purpose it may be smoked as cigarettes or the fumes may be inhaled, or it may be given internally. When combined with potassium nitrate, lobelia, black tea, and oil of anise it resembles the well-known *Himrod's*, *Bliss's* and *Green Mountain Cures*. Cannabis Indica is also an excellent adjuvant.

Toxicology.—Poisoning by stramonium is fairly common in England, and the seeds of *Datura alba* and *fatuosa* are largely used by the *road-poisoners in India*, who mix them with sweetmeats or food, or give them to their victim to smoke, with the object of robbery.

The **symptoms** are dryness of the throat, giddiness, flushing of the face, dilatation of the pupils, and a peculiar form of delirium associated with ludicrous movements, followed by coma which may end in death.

Treatment.—Emetics, stomach-pump, stimulants, cold affusion, artificial respiration. If much delirium, give opium, but opium is less useful in these cases than atropine in opium poisoning.

Brunton recommends the cautious use of physostigma, and Ringer advises pilocarpine nitrate in $\frac{1}{2}$ to $\frac{1}{4}$ grain doses.

Detection.—*Datura* seeds resemble those of capsicum, but may be distinguished by the absence of a pungent taste and by the embryo being less curled. There are no special chemical tests for Daturine, but the physiological test (action on the pupil) is extremely delicate.

STROPHANTHI SEMINA

Strophanthus Seeds. N.O. *Apocynaceæ*

Habitat.—Equatorial East Africa.

Source.—The dried ripe seeds of *Strophanthus Kombé* freed from awns.

Characters.—Greenish-fawn, $\frac{3}{8}$ in. long, $\frac{1}{8}$ in. broad, blunt base, tapering apex, sides flattened, one side having a median ridge and the other being convex, covered with silky appressed hairs. Characteristic odour. Taste very bitter. A section of the seed should give a green colour with sulphuric acid.

Composition.—(1) A transparent, white, micro-crystalline glucoside, *Strophanthin*, which is the active principle. It is closely allied to Digitalin. Melts at 170° to 172° , and splits up into Strophanthidin and the methyl-ether of a peculiar sugar. Gives a green reaction with sulphuric acid. The seeds contain 8 to 10 p.c. of it. Soluble in water, insoluble in chloroform and ether. Its physiological action resembles that of Ouabain (see below). (2) *Kombic acid*. (3) *Incin*, an active principle.

Note.—*Strophanthus hispidus* contains a glucoside, *Pseudo-strophanthin*, which differs from strophanthin in giving a red colour with sulphuric acid, and in melting at 179° C. It is twice as active as the former.

Action.—Cardiac tonic.

OFFICIAL PREPARATIONS

1. **Extractum Strophanthi.**—Dried powdered seeds percolated first with ether, then with alcohol, again dried and diluted with milk sugar. B.P. Dose.— $\frac{1}{2}$ to 1 gr.

2. **Tinctura Strophanthi.**—1 in 40, made with alcohol (70 p.c.). Percolate. B.P. Dose.—5 to 15 ms.

NON-OFFICIAL PREPARATIONS

1. **Ouabain.**—A crystalline glucoside, extracted from the Somali arrow-poison of East Africa. It is prepared from Ouabaio wood, *Akanthium Ouabaio*, of the same natural order as *strophanthus*. Colourless, rectangular lamels, slightly soluble in cold water, freely in hot. Gives a red colour with sulphuric acid, and resembles Strophanthin in its physiological action, but is twice as poisonous and twice as rapid. Produces anæsthesia of the cornea and conjunctiva. Has been recommended in whooping-cough, in doses of $\frac{1}{1000}$ to $\frac{1}{200}$ gr. every three hours.

2. **Strophanthin, B.P.C.**—Already described. Dose.— $\frac{1}{100}$ to $\frac{1}{200}$ gr. Only used hypodermically. Unreliable, and inferior to Tr. Strophanthi.

3. **Pilula Strophanthi.**—Containing 2, 4, or 8 ms. of Tr. Strophanthi mixed with sugar of milk. *Dose.*—1 to 3 pills.

4. **Tabellæ Strophanthi.**—Containing 4 ms. of tincture, with a chocolate basis. *Dose.*—1 to 3 pills.

PHARMACOLOGY

Externally.—Both ouabain and strophanthin cause **anæsthesia of the conjunctiva and cornea.**

Internally. **Gastro-intestinal tract.**—In small doses it is a **stomachic tonic**, and large doses may cause nausea and vomiting, but it is **less irritating than digitalis.**

Muscles.—It is a **powerful poison to all striated muscles**, which it stimulates strongly.

Heart.—Action exactly **similar to that of digitalis** (which see, p. 382). It however **acts more quickly** and **does not accumulate** in the system.

Vessels.—It does **not contract the peripheral vessels** and therefore causes less rise of blood-pressure than digitalis.

Kidneys.—It is **less powerful as a diuretic** than digitalis, as it causes no change in the renal vessels, and the increased secretion of urine is merely due to more powerful action of the heart.

Nervous system.—It appears to have some **sedative action on the cerebrum and medulla.**

Respiratory system.—No effect.

THERAPEUTICS

The *Kombé arrow-poison* of the Zambezi negroes is made from strophanthus, and its physiological action was discovered by a missionary, who accidentally got some of the poison on his toothbrush.

Introduced into medicine by Fraser as a **substitute for digitalis**, especially in cases of **chronic interstitial nephritis with increased arterial tension.** It is said to be particularly useful in **mitral stenosis**, but on the whole it has not come up to the expectations formed of it. It is a **feeble diuretic** and therefore *digitalis should always be used when diuresis is required.*

It possesses the following advantages over digitalis:—(1) it is less likely to cause vomiting, (2) it does not accumulate in the system, (3) it acts more quickly and its effects pass off more rapidly, (4) it does not cause contraction of the small arteries.

In the treatment of **mitral disease** the rule is to begin with *digitalis* and then change to strophanthus if the former disagrees; and where a prolonged course of treatment is required, as in cases of **failing compensation**, it will be found a highly satisfactory plan to give digitalis for two months, and then strophanthus combined with Easton's syrup, for one month. It has given good results in **exophthalmic goitre**, and is said to be of special value in **renal insufficiency**,

the cardiac failure of prolonged typhoid fever, and in heart weakness of a functional nature.

STRYCHNINA. See page 511

STYRAX PRÆPARATUS

Prepared Storax. N.O. *Hamamelaceæ*

Habitat.—Asia Minor.

Source.—A purified balsam, obtained from the trunk of *Liquidambar orientalis*.

Characters.—A semi-transparent, semi-fluid, brownish-yellow balsam having a balsamic taste and an agreeable odour.

Composition.—(1) *Styrene*, a derivative of cinnamic acid. (2) *Cinnamic acid*, which can be oxidized into benzoic acid. (3) *Styracin*, which is cinnamate of cinnamyl. (4) *Two resins*.

Identification.—Resembles Confectio Sulphuris, but distinguished by its taste and smell.

Action.—Expectorant, parasiticide. **Dose.**—5 to 20 grs.

Enters into.—Tinct. Benzoini Composita.

PHARMACOLOGY AND THERAPEUTICS

Resembles benzoin and the balsams of Peru and Tolu in its action. It is a feeble expectorant and has some tonic effect on the mucous membrane of the genito-urinary tract. Twenty grains, made into a bolus with liquorice, is occasionally used in gonorrhœa, but is rarely given internally except in the form of Friar's Balsam. Mixed with an equal part, or twice its bulk of olive oil, it is efficacious in scabies and phthiriasis, but albuminuria has been known to follow its application.

SULPHONAL. Sulphonal



Syn.—*Di-methyl-methane-diethylsulphone*.

Source.—It is an oxidation product, resulting from the combination of mercaptan with acetone, and may be regarded as methane (CH_4), in which two atoms of H are replaced by two molecules of ethyl-sulphonic acid, and two other atoms of H by two molecules of methyl.

Characters.—Colourless crystals, or powder, without smell or taste.

Solubility.—1 in 450 of cold, 1 in 15 of hot water, 1 in 50 of alcohol, 1 in 90 of ether, 1 in 3 of chloroform.

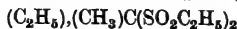
Action.—Hypnotic.

B.P. Dose.—10 to 30 grs.

NON-OFFICIAL PREPARATIONS

1. **Tabellæ Sulphonæ.**—5 grs. in each. **Dose.**—1 to 6, should be crushed before swallowing.

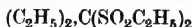
2. **Hauftus Sulphonæ, G.H.**—Sulphonæ 30 grs., mucilage 2 drs., syrup 30 ms., water 1 oz. **Dose.**—1 oz.

TRIONAL (*Non-official*)

Syn.—*Diethylsulphone-ethyl-methyl-methane*.

Source.—Sulphonal, modified by the substitution of one molecule of ethyl for one molecule of methyl.

Characters.—Minute shining crystals. *Solubility*.—1 in 480 of water. *Dose*.—10 to 30 grs.

TETRONAL (*Non-official*)

Syn.—*Diethyl-menthane-diethylsulphone*.

Source.—Sulphonal, in which two of the methyl groups have been replaced by two of ethyl.

Characters.—Shining white, crystalline tablets, or acicular crystals with no smell but a camphoraceous bitter taste. *Solubility*.—1 to 450 of water, 1 in 15 of alcohol. *Dose*.—10 to 20 grs.

PHARMACOLOGY AND THERAPEUTICS

Sulphonal is a pure **hypnotic**, and does not depress the heart like chloral, or cause the disagreeable after-effects of opium. It is very useful in simple **insomnia**, and may safely be given in cases where chloral would be dangerous, as in heart disease. On the other hand, it is powerless in the sleeplessness due to pain, and cannot produce that soothing effect on the brain which is induced by morphia. Its administration is sometimes followed by **hæmatoporphyrinuria**, especially in women; and its long-continued use may be followed by **nephritis**, with **albuminuria**, **ischuria** and **oliguria**, as well as by characteristic disturbances of digestion and the nervous system. Luckily however it rarely leads to the "sulphonal habit."

It has yielded good results in **chorea**, in **trismus neonatorum** and in **diabetes**; and it **relieves spasms and cramps in fractured limbs**.

Although enormous doses have been taken without any ill results, the administration of the drug is not without risk when administered to patients in a state of physical prostration, and alarming symptoms have occurred after 20 grain doses given to patients convalescent from influenza. Restlessness, palpitations, giddiness, and confusion of thoughts have occasionally been observed to take the place of sleep, and this is particularly likely to happen if the patient be suffering from chronic constipation. This is a fact that is well worth bearing in mind. Sulphonal has also a remarkable power, when given in small doses, of checking or preventing the night-sweats of phthisis.

Trional and tetronal resemble sulphonal in their effects, but they are more prompt in their action and are slightly cumulative, their toxicity appearing to increase in proportion to the increase in the ethyl groups. They have been largely used in **mental diseases**

in which sulphonal has little or no effect. Tetronal is the best sedative, but trional is the most popular, and is most useful in **neurasthenia** and **organic brain diseases**. It is also very valuable in the **sleeplessness of children**.

Prescribing hints.—Sulphonal may be given either in cachets or suspended in mucilage, but the best method of administration is to dissolve it in two-thirds of a tumblerful of *boiling* water and then stir until it is cool enough to drink. It will then act very speedily, whereas when given in cachet it may remain undissolved in the stomach for hours, giving the patient no relief at night, and making him feel sleepy all the following day.

SULPHUR SUBLIMATUM

Sublimed Sulphur

Syn. B.P.—*Flowers of Sulphur*. **Syn. I. V.**—*Gandak*, Beng.

Source.—By sublimation from crude or rough sulphur.

Characters.—A greenish-yellow gummy powder, without taste or smell unless heated, when it evolves fumes of sulphurous anhydride. *Impurities.*—Sulphide of arsenic, sulphurous and sulphuric acids. *Solubility.*—Insoluble in water or alcohol; slightly soluble in oils and fats, completely soluble in carbon disulphide.

Tests.—Water agitated with it should not redden litmus paper (absence of free acids), and when filtered should not give a precipitate with sulphuretted hydrogen (absence of arsenious acid).

Action.—Laxative, parasiticide.

B.P. Dose.—20 to 60 grs.

OFFICIAL PREPARATIONS

1. **Confectio Sulphuris**.—1 in 2½. **B.P. Dose.**—60 to 120 grs.
2. **Unguentum Sulphuris**.—1 in 10. Made with adeps benzoata.

NON-OFFICIAL PREPARATIONS

1. **Confectio Guaiaci Composita**, **L.H.** *Syn.*—*Chelsca Pensioner*—Guaiacum 2, sublimed sulphur 3, magnesium carbonate 2, ginger 1, treacle, by weight, 12. *Dose.*—1 to 2 drs. (*See also* p. 430.)

2. **Unguentum Sulphuris Co.**, **B.P.C.** *Syn.*—*Walkinson's Ointment*—Soft soap 30, sublimed sulphur 15, precipitated chalk 10, tar 15, lard 30

3. **Unguentum Sulphuris c. Hydrargyro**, **U.C.H.**—Sublimed sulphur 30 mercuric sulphide 2, ammoniated mercury 2, olive oil 12, lard 54 *In scabies and skin diseases of doubtful origin.*

4. **Unguentum Sulphuris Hypochloritis**, **B.P.C.**—Sublimed sulphur 12, essential oil of almonds 2, prepared lard 84, sulphur chloride 2. *Keep in stoppered bottle. Used in acne, psoriasis and scabies.*

SULPHUR PRÆCIPITATUM

Precipitated Sulphur

Syn. B.P.—*Milk of Sulphur*.

Source.—By boiling sulphur with slaked lime and water, filtering, and then re-precipitating the sulphur by hydrochloric acid.

Characters.—A smooth, not gritty, powder of a greyish colour, with only a slight tinge of yellow. **Impurity.**—Calcium sulphate due to sulphuric acid being used instead of hydrochloric acid, which is more expensive.

Tests.—Should not be gritty, or show crystals of sulphate under the microscope. Should volatilize completely by heat, leaving no residue.

B.P. Dose.—20 to 60 grs.

OFFICIAL PREPARATION

1. **Trochiscus Sulphuris.** *Syn.*—"Garrod's Lozenges."—Precipitated sulphur 5 grs., acid potassium tartrate 1 gr., in each lozenge.

NON-OFFICIAL PREPARATIONS

1. **Jephson's powder.**—Precipitated sulphur 2, guaiacum 1. For *tonsillitis, acne, and constipation.* *Dose.*—60 grs.

2. **Pastillus Sulphuris Compositus, B.P.C.**—Pastils having the same composition as the lozenges, but with a basis of glyco-gelatin.

3. **Ung. Sulphuris et Resorcini, B.P.C.**—Precipitated Sulphur 4.50, Resorcin 3, yellow Soft Paraffin to 100.

PHARMACOLOGY

Externally.—When applied to the whole skin, pure sulphur has no effect, but if it be mixed with any greasy substance, some of it is converted into sulphuretted hydrogen which acts as a mild irritant, causing dilatation of the vessels and, in delicate skins, sometimes even eczema. It is a **parasiticide**, and rapidly causes the death of the **itch-insect**. Sulphur acts as a keratoplastic or reducing agent upon the epidermis and withdraws oxygen from the tissues, thereby favouring cornification of epithelial cells. When it is brought into contact with living protoplasm, sulphurous and sulphuric acids are formed: it therefore is a violent irritant to raw surfaces and it destroys fungi and low forms of vegetable life. This action is made use of in protecting the vines from the fungus which causes the **vine disease** in Italy.

Internally. **Gastro-intestinal tract.**—Being insoluble in the fluids of the mouth, sulphur has no taste, neither does it undergo any change in the stomach. When however it reaches the small intestine, it comes in contact with the alkaline bile, and a small portion, being converted into an alkaline sulphide, is absorbed as such, but the greater portion passes unchanged through the bowels and is excreted with the feces. The amount absorbed depends on the preparation used, and Buchheim has shown that as much as 46 p.c. of the finely divided precipitated sulphur can be detected in the urine, but only 15 p.c. of sublimed sulphur is eliminated in this way. In the intestine, sulphur acts as a **mild laxative**, causing soft motions without as a rule any colic. *There are three theories as to the manner in which this drug acts on the bowels.*—(1) That the alkaline sulphides and sulphuretted hydrogen both stimulate the peristaltic action of the bowel and increase the secretion of intestinal juice. (2) That the sulphuretted hydrogen, being generated under

pressure, forces the fæces in front of it in the same way that the cork is driven out of a pop-gun. (3) That the gritty particles of sulphur act as a mechanical stimulus to the muscular coats of the intestines. It is probable that both of the first two theories are correct; there is no doubt that much sulphuretted hydrogen is generated in the bowels when a patient is taking sulphur, and this constitutes the chief objection to its use, as the smell of the gas is very offensive. Against the third theory is the fact that precipitated sulphur, which is not gritty, is the more effectual purgative of the two.

Remote effects.—Sulphur is said to increase the secretion from the mucous membrane of the bronchial tubes of healthy persons, also to increase the frequency and force of the heart's contractions, and to promote the flow of perspiration: this however is doubtful. It is absorbed into the blood as sulphides and sulphuretted hydrogen which is a powerful poison, first reducing and then decomposing hæmoglobin: it thus causes internal asphyxia. It also acts as a paralyser of the nervous and muscular systems. Sulphur is never given internally in sufficiently large doses to produce these remote effects, but it is probable that many of the obscure nervous symptoms that accompany certain forms of dyspepsia and constipation, and which are called "*auto-intoxication*," are due to the development of sulphuretted hydrogen in the bowel and its subsequent absorption into the blood. Sulphur is excreted chiefly as sulphates by the urine, and as sulphuretted hydrogen by the lungs, skin, and milk. It gives an offensive smell to the breath, and blackens silver ornaments that are worn next the skin. Seeing that sulphur exists in large quantities in the bile, some observers maintain that it is a restorative in those conditions which are marked by a deficiency of that fluid, and which are known as "*acholia*." It has no effect on albuminous waste.

THERAPEUTICS

Externally.—Sulphur is chiefly used in the treatment of **scabies** or itch. The patient should be instructed to scrub the skin well with soap and water at bedtime, then rub in the ointment and sleep in flannel garments. He may wash off the ointment when he rises in the morning. In this way, itch can be cured in a few days. When the cure is complete the patient must be warned to change his linen, and have it thoroughly disinfected to destroy any eggs of the parasite that may remain in it. On account of the irritation caused by sulphur and its disagreeable smell, some physicians substitute storax for it in the treatment of this disease.

If scabies be complicated by **eczema** and **impetigo**, the best preparation to use is the Unguentum Sulphuris Co., B.P.C., the various constituents of which act as follows:—(1) the chalk mechanically breaks up the dead skin and opens up the burrows of the parasite, (2) the tar cures the eczema, and (3) the alkali in the soap checks the weeping from the raw surface. This ointment, accompanied

by the use of the warm bath, is applied twice daily, and cures in three days.

For the cure of **acne**, a lotion, consisting of sulphur 1 dr., glycerin 1 oz. in 10 ozs. of rose water, should be substituted for the ointment which is a very unsightly application to the face. Some of the severer forms of acne, however, will only yield to the Unguentum Sulphuris Hypochloritis. As an insufflation or dusting-powder, sulphur is said to be of value in **diphtheria**, and great relief is often obtained in **rheumatism and sciatica** by rubbing the affected limbs with sulphur and then applying flannel bandages.

Internally.—Sulphur is largely used as a laxative in **hæmorrhoids and fissure of the anus**, in which case it not only acts as a purgative, but it also has a direct soothing effect on the hæmorrhoidal vessels. Equal parts of the confections of senna and sulphur is a favourite prescription. Too long use of this drug leads to dyspepsia and catarrh of the bowels. It is given in **plumbism** to prevent reabsorption of lead from the intestines. In the form of "Chelsea Pensioner" it is a favourite remedy for **chronic rheumatism and gout**. In olden days the disciples of Hippocrates employed it largely in the treatment of **asthma**, and many modern physicians consider it of value as a remedy for **chronic bronchitis**, for which purpose it may be given in the form of the Spanish onion, which should be well boiled and eaten at bedtime. Formerly rectal injections of sulphuretted hydrogen were administered in **phthisis** but this practice has fallen into disuse. It is beneficial in many chronic skin diseases, as **psoriasis, impetigo, eczema**, and **acne**, and it acts as a sedative to the nervous system in **many troubles of the menopause**.

Prescribing hints.—The confection, even when freshly prepared, is a very nauseous compound, and, when it is old, it sets into a hard mass like plaster. The lozenge is the most elegant method of administration to better-class patients, and if for any reason the use of sugar is inadvisable, the pastils may be substituted. To children sulphur is best given in the form of the compound liquorice powder, or it may be suspended in milk, honey or marmalade.

CALX SULPHURATA. See page 300

POTASSA SULPHURATA. Sulphurated Potash

Syn. B.P.—*Liver of Sulphur.*

Source.—By heating together sulphur and carbonate of potash.

Characters.—Solid, dull-green fragments, liver-brown when freshly broken, reaction alkaline, taste acid.

Composition.—It is a mixture of salts, chiefly potassium sulphides.

Dose.—2 to 10 grs.

Action.—Antiparasitic and narcotic.

NON-OFFICIAL PREPARATION

1. **Unguentum [Potassæ Sulphuratæ, B.P.C.]**—1 in 80, made with hard and soft paraffin.

SULPHURIS IODIDUM. Sulphur Iodide. SI

Source.—Sublimed sulphur and iodine are fused together.

Characters.—Greyish-black crystalline masses, smelling like iodine.

Solubility.—Insoluble in water, soluble 1 in 60 of glycerin.

OFFICIAL PREPARATION

1. **Unguentum Sulphuris Iodidi.**—1 in 25, made with Adeps Benzoata.

Dispensing hint.—Unguentum Sulphuris Iodidi must be very carefully prepared, as, unless the iodide be very finely powdered, small craggy masses will remain, which will cause severe irritation of the skin.

**PHARMACOLOGY OF THE ALKALINE SULPHIDES
AND SULPHUR IODIDE**

Externally.—All are **irritants** and **parasitocides**. Strong solutions of the soluble potassium salt excite active inflammation of the skin; weak solutions stimulate it, causing **dilatation of the cutaneous vessels** and **diaphoresis**.

Internally.—Nothing is known of the action of sulphur iodide. The alkaline sulphides possess the same action as sulphuretted hydrogen, to which they owe their virtues. They **decompose the blood**, producing asphyxia, and they **paralyse the nervous and muscular systems**. Large doses give rise to **narcotic symptoms and convulsions**. They are partly decomposed by the acids in the stomach, giving rise to disagreeable eructations of sulphuretted hydrogen. In small doses they merely cause a sensation of warmth in the epigastrium, and determine **gentle relaxation of the bowels**, but large doses set up **gastro-enteritis**. All the sulphides possess the power of **arresting and preventing suppuration**: they also have a **tonic effect on mucous membranes**. The constant inhalation of air impregnated with sulphuretted hydrogen **causes anæmia** and much functional depression.

**THERAPEUTICS OF THE ALKALINE SULPHIDES AND
SULPHUR IODIDE**

Externally.—Unguentum Potassæ Sulphuratæ may be used as a substitute for sulphur ointment in the treatment of **scabies**, but a better preparation is the Lotio Calcis Sulphurati, or **Vleminckx's solution**, which according to Bourguignon will cure the disease in half an hour (see page 303). Solutio Calcii Oxy-sulphurati (Vleminckx's solution) according to the Austrian Pharmacopœia has the following composition:—

One of Calcium Oxide slaked with 1 of water and mixed with 2 of washed Sulphur; of the foregoing mixture 2·5 is boiled with 20 of water until it is so reduced as to yield 10 by weight when strained.

In the form of a bath (4 ozs. to 30 gallons of water) sulphurated potash is used in **chronic psoriasis**, **chronic rheumatoid arthritis**

and **myalgia**, **chronic nervous diseases** and as a **diaphoretic** in **albuminuria**. These baths are also said to promote the elimination of the poison from the system in **plumbism** and **hydrargyrisms**, whilst the combination of sulphide baths with the internal administration of mercury constitutes the celebrated "**Aix**" treatment for **syphilis**, as practised at Aix-la-Chapelle. Unguentum Sulphuris Iodidi is the best preparation we possess for the cure of **acne rosacea**, **acne indurata**, and the **bromide and tar acnes**. Instead of using artificially prepared baths, it is best wherever possible to resort to the natural mineral springs which contain alkaline sulphides. The best known are:—*Harrogate* in England, *Strathpeffer* in Scotland, and *Bareges* and *Aix-la-Chapelle* in France: whilst in India the sulphur springs at *Bhajji* near Simla have a great local reputation. An excellent imitation of the Bareges waters may be made by combining sodium sulphide, sodium carbonate, and sodium chloride in the proportion of 20 grs. of each to every gallon of water.

Internally.—The natural sulphurous waters are specially useful in **follicular pharyngitis** and are much resorted to by public singers in Europe. They also increase both the secretion of bile and the amount of solids in it, on which account they are highly esteemed in the treatment of all **hepatic disorders**. The two sulphides are useful in **boils**, **carbuncles**, and **scrofulous glands**. Calx Sulphurata (which see) is the better preparation, but Potassa Sulphurata may also be used for this purpose. The latter drug has also been given in **chronic bronchitis**, **croup**, and **whooping-cough**, and as a **rectal injection** for the destruction of *Oxyurides*.

Prescribing hints.—Sulphide bath must always be given in porcelain or wooden vessels, as the salt attacks and discolours metals. Remember that these baths have the offensive smell of rotten eggs, and that you must therefore be careful how you prescribe them for delicate or fanciful patients.

SUMBUL RADIX. Sumbul Root

N.O. *Umbelliferae*

Syn.—*Musk root*.

Habitat.—Russia and India.

Source.—The dried transverse sections of the root of *Ferula sumbul*.

Characters.—Cylindrical pieces, $\frac{1}{2}$ to 1 in. thick, varying considerably in diameter, usually from 1 to 3 in. Covered on the outer edge with a dusky brown rough bark, beset with short bristly fibres. Cut surface felt-like, coarsely fibrous, dirty yellowish-brown, mottled with spots of exuded resin. Smell like that of musk. Taste at first sweetish and aromatic, afterwards bitter.

Resembles.—*Calumba*, but distinguished by its porous texture and musk-like smell.

Composition.—(1) A volatile oil. (2) Two resins. (3) *Valerianic acid*. (4) *Angellic acid*. (5) *Sumbulic acid*.

Action.—Nervine stimulant, and antispasmodic.

OFFICIAL PREPARATION

1. *Tinctura Sumbul*.—1 in 10. Made with *fresh* root. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.

PHARMACOLOGY AND THERAPEUTICS

Its action resembles that of the other volatile oils; it is an **anti-spasmodic**, and may be given for the relief of **flatulence**. It is supposed to be a **nervine tonic**, resembling valerian and musk, and on that account it has been used in the treatment of **hysteria**, **neurotic conditions**, **adynamic fevers**, **dysentery**, **diarrhoea**, **asthma**, **delirium tremens** and **epilepsy**, but it is probably of very little use and will doubtless disappear from the next edition of the B.P.

TAKA DIASTASE. (*Non-official*)

Syn.—Koji.

Habitat.—Japan.

Source.—A ferment produced by a fungus, *Eurotium oryzae*, on heated rice. It may also be cultivated on bran.

Characters.—A yellowish-white powder, which changes in a few minutes a hundred times its weight of starch into maltose.

Action.—Amylolytic. **Dose.**—1 to 5 grs. in water.

PHARMACOLOGY AND THERAPEUTICS

It is very valuable in all forms of **starchy dyspepsia with hyperacidity**, such as are so common amongst the rice-eating inhabitants of Bengal, and it will be found *preferable to pepsin in all cases of this kind*. It may be combined like papain with sodium bicarbonate, and it shares with this drug the advantage that, being a purely vegetable product, it may be given *without offence to the strictest Hindus and Mahomedans*.

TAMARINDUS. Tamarinds

N.O. *Leguminosæ*

Habitat.—West Indies.

Source.—The pulp of the fruit of *Tamarindus indica*, preserved in sugar.

Characters.—A reddish-brown, moist pulp, containing strong fibres, and brown shining seeds, each enclosed in a membranous coat. Taste agreeable, sweetish, subacid. **Impurity.**—Copper.

Tests.—A piece of bright iron, left in contact with the pulp for an hour, should show no deposit of copper.

Composition.—(1) *Tartaric acid* and *potassium tartrate*. (2) *Citric, acetic*, and other acids. (3) *Invert sugar*.

Enters into.—*Confectio Sennæ*, 9 in 75.

Action.—Laxative, refrigerant. **Dose.**— $\frac{1}{2}$ oz. and upwards.

PHARMACOLOGY AND THERAPEUTICS

As a refrigerant, tamarind whey (tamarind 1, milk 30) is given as a drink in **fevers**. It is a mild laxative, and when spread on bread and butter forms a **pleasant purgative for children**.

TARAXACI RADIX

Taraxacum Root. N.O. *Compositae***Syn.**—Dandelion Root.**Habitat.**—England.**Source.**—The dried and fresh roots of *Taraxacum officinale*. Collected in the autumn.**Characters.**—About 12 in. long, $\frac{1}{2}$ in. in diameter. Tap-shaped roots, which, when fresh, are smooth and yellowish, brown externally, white within, and giving out a bitter inodorous milky juice. When dried, the root is dark brown, shrivelled, and furrowed longitudinally. Taste bitter. **Impurity.**—Common hawkbit, fraudulently mixed.**Identification.**—Resembles Pellitory, which is not bitter and causes a tingling sensation to the tongue when chewed.**Tests.**—Hawkbit is wrinkled and pale coloured externally, and has a watery juice.**Composition.**—(1) *Taraxicin*, a bitter principle. (2) *Taraxacerin*. (3) *Asparagin*, of no therapeutical value. (4) *Inulin*, mannite. (5) A considerable quantity of *potassium* and *calcium* salts. (6) *Resins*, to which the milky appearance of the juice is due.**Action.**—Diuretic, laxative, tonic, and feeble cholagogue.

OFFICIAL PREPARATIONS

1. **Extractum Taraxaci.**—Made with *fresh root*. B.P. Dose.—5 to 15 grs.
2. **Extractum Taraxaci Liquidum.**—Made with *dried root*. B.P. Dose.— $\frac{1}{2}$ to 2 drs.
3. **Succus Taraxaci.**—Alcohol (90 p.c.). B.P. Dose.—1 to 2 drs.

PHARMACOLOGY AND THERAPEUTICS

The fresh juice or even an infusion prepared from the fresh root, has decidedly **tonic** effects, somewhat resembling those of calumba; it is also slightly **laxative**, but it is extremely doubtful whether the preparations obtainable from the chemists' shops have any therapeutic effect whatever. This drug is very little used nowadays, and it has lost its reputation as a **cholagogue** and **diuretic**.

TEREBENUM. Terebene

Source.—Obtained by the action of sulphuric acid on turpentine, and subsequent distillation.**Characters.**—A colourless liquid, with a pleasant pine-wood odour. Should not affect the plane of polarized light. Sp. gr. 0.862 to 0.866. Is not miscible with water, but may be emulsified by mixing with one-sixth its weight of tragacanth, then adding water and shaking well.**Composition.**—A mixture of *diptene* and other hydrocarbons.**Dispensing hint.**—The official terebene must not be confounded with a dark-coloured liquid, which is sold under a similar name as a cheap disinfectant. This preparation is a useful deodorizer for the sick-room, but does not permeate decomposing substances, as it is not soluble in water; it is therefore of little value as a disinfectant.

Action.—Antiseptic, stimulating expectorant.

B.P. Dose.—5 to 15 ms.

NON-OFFICIAL PREPARATIONS

1. **Capsules**, containing 5 and 10 ms.
2. **Haustus Terebeni**. *Vict. Park.*—Terebene 10 ms., mucilage of tragacanth 1 dr., glycerin 1 dr., cinnamon water to 1 oz.
3. **Mistura Apomorphinæ et Terebeni**.—Apomorph. Hydrochlor. $\frac{1}{16}$ gr., Terebene 15 ms., Balsam of Peru 10 ms., Mucilag. Acaciæ 2 drs., Syrup 30 ms., Water to 1 oz. *Dose.*—1 oz.
4. **Vapor Terebeni, T.H.**—Terebene 40 ms., Magnes. Carb. Levis 20 grs., Water to 1 oz. A teaspoonful of this in a pint of water at 140° F. as an inhalation.

PHARMACOLOGY AND THERAPEUTICS

As a *stimulating expectorant*, it has been given by Murrell with success in **chronic bronchitis** and **winter cough**, especially when complicated with **emphysema**. It may be exhibited in various ways :—
(a) *Externally*,—either as an inhalation in the form of the Vapor, or 15 to 30 drops may be sprinkled on the cotton-wool of an antiseptic respirator, or it may be used as a spray. (b) *Internally*,—as a mixture, either alone or combined with apomorphine and other expectorants ; or five drops may be taken a few times a day on a lump of sugar, or in capsules or thick syrup.

As an *antiseptic and sedative*, the vapour of terebene is useful in **phthisis**, in which disease it is usual to combine it with equal parts of phenol and thymol, or phenol and spirits of chloroform, and use 10 drops of this mixture for medicating the antiseptic respirator. It should at the same time be given internally, as the terebene destroys the bacilli of the swallowed sputa and lessens the risk of tubercular infection of the bowels. Terebene acts on the mucous membrane of the urinary and gastro-intestinal tracts in much the same way as turpentine, and it is said to be of value in **dysentery**.

Betrin reports that plugs of wool soaked in terebene give splendid results when applied to **epitheliomata of the cervix uteri**.

Prescribing hint.—Terebene must be given with caution to gouty patients, who are the subjects of chronic kidney troubles, as it may increase the albuminuria in cases of this kind.

TEREBINTHINA CANADENSIS

Canada Turpentine. N.O. *Coniferæ*

[**Syn. B.P.**—*Canada Balsam, Balsam of fir*, U.S.P.

[**Habitat.**—Canada.

[**Source.**—An oleo-resin obtained from *Abies balsamea* (Balm of Gilead fir).

Characters.—A pale yellow, transparent fluid, resembling thin honey. Odour pleasant, characteristic. Taste bitterish. Dries slowly, forming a clear varnish. **Solubility.**—In ether, chloroform, and spirit.

Composition.—(1) An essential oil, isomeric with oil of turpentine, and (2) various resins.

Dose.—20 to 30 grs.

Enters into.—Collodion flexile.

PHARMACOLOGY AND THERAPEUTICS

Its action is the same as that of oil of turpentine, but it is only used for its physical properties, and in the preparation of microscopic specimens. It may however be given internally as a stimulant to mucous membranes, and it has occasionally been prescribed (in the form of a pill with magnesium carbonate) for **gleet** and **chronic gonorrhœa**.

TEREBINTHINÆ OLEUM. Oil of Turpentine

N.O. *Coniferae*

Syn.—Spirit of Turpentine.

Habitat.—England, America, France, and Russia.

Source.—An oil distilled by the aid of steam from the oleo-resin (common turpentine) which exudes from *Pinus sylvestris* and other species.

Characters.—Limpid, colourless, with a strong, characteristic odour, and a pungent taste. Neutral. Mixes with other oils. Dissolves wax, sulphur, phosphorus, iodine, and resins (forming varnishes). Easily oxidized. Old oil of turpentine is an ozonizing agent and may be used as a test for blood. The English, American, and Russian oils deflect the ray of polarized light to the right, but the French oil is *lævo*-rotatory. **Solubility.**—Insoluble in water; soluble 1 in $6\frac{1}{2}$ of alcohol (90 p.c.), 3 in 10 of ether, and in all proportions of absolute alcohol, chloroform, and carbon disulphide.

Composition.—(1) Several *terpenes*, all having the formula $C_{10}H_{16}$, the chief being *pinene*, *phellandrene*, *limonene*, and *dipentene*. (2) *Sesquiterpenes*, $C_{15}H_{24}$. (3) *Bornyl acetate*.

Note.—Many official volatile oils contain various terpenes, all isomeric and all having the same general formula $C_{10}H_{16}$. Camphor and Sanitas are both products of terpenes.

Dispensing hint.—In order to emulsify turpentine it is necessary to rub it up thoroughly with twice its bulk of mucilage.

Action.—Rubefacient, stimulant, diuretic, anthelmintic, cathartic.

B.P. Dose.—2 to 10 ms.; or 3 to 4 drs. as an anthelmintic.

OFFICIAL PREPARATIONS

1. **Linimentum Terebinthinæ.**—13 in 20, made with camphor, soft soap and water.

2. **Linimentum Terebinthinæ Aceticum.**—4 in 9.

NON-OFFICIAL PREPARATIONS

1. **Terpini Hydras, B.P.C.** *Syn.*—*Terpine.*—A derivative of oil of turpentine, in prismatic crystals, resembling chloral hydrate. Soluble in water 1 in 280, alcohol 1 in 10. Should have no odour of terebene.

Used in *bronchitis*, *phthisis*, *hæmoptysis*, and as a diuretic. *Dose*.—3 to 10 grs. in cachet, pill or suspended.

2. **Terpinol, B.P.C.**—An agreeable aromatic liquid, obtained by the action of dilute sulphuric acid on terpene. *Dose*.—1 to 2 ms., given during meals.

3. **Terpini Di-iodidum.** *Syn.*—*Pneumococcine*.—An oily colourless liquid insoluble in water. Obtained by heating under pressure terpene and iodine. Highly bactericidal in action. Used subcutaneously in *pneumonia* and in capsule form in *tuberculous diarrhœa*.

PHARMACOLOGY

Externally.—When rubbed into the skin, it is **rubefacient**, **irritant**, and **counter-irritant**, and later on a **local anæsthetic**. In large amounts, it is a **vesicant**. It is also **antiseptic** and **disinfectant**, and it is absorbed by the unbroken skin.

Internally. **Gastro-intestinal tract.**—In the stomach it causes dilatation of the gastric vessels, and increases both the peristaltic movements and the secretion of gastric juice: at the same time it **reflexly stimulates the heart**, but on account of its sickening taste it is never used for this purpose, as other volatile oils act equally well and are not so nasty. In the intestines, it causes powerful peristaltic movement and expulsion of flatus: it is therefore a strong **carminative**. In large doses it causes great vascular dilatation and **purging**, the stools containing large quantities of blood. In doses of 2 to 4 drs. it is an **anthelmintic** killing the **tapeworm**, but this treatment is too dangerous for adoption. As an enema, it kills **Oxyurides**.

Circulation.—It is readily absorbed, and then acts as a **direct stimulant to the heart**, increasing both the force and the frequency of its beats. It at first causes contraction of the small vessels, and is therefore a **hæmostatic**. It circulates as turpentine, and causes a rise and then a fall of blood-pressure, due to its first stimulating and then paralysing the vaso-motor centres. Its action on the pulse varies: sometimes it is quickened and sometimes slowed.

Respiration.—When inhaled it produces sneezing, a tight feeling across the eyes, and dyspnoea, due to reflex irritation from the action on the nasal mucous membrane. It directly irritates the bronchial mucous membrane, causing dilatation of the vessels, increase of secretion, and stimulation of the muscular coats of the bronchi, whilst reflexly it excites cough. At the same time it increases the activity of the respiratory movements, and is therefore a **powerful expectorant**. If the secretion is purulent, it is disinfected. When taken internally, turpentine is excreted by the bronchial mucous membrane, and has a similar action to that already described.

Nervous system.—Large doses cause **languor**, **hebetude**, **drowsiness** and **unsteadiness of gait**. Toxic doses are followed by **coma** and **paralysis of the sensory nerves**, with abolition of reflex action.

Kidneys.—Here its action is especially powerful. Comparatively small doses may cause **lumbar pain**, **scanty urine**, **albuminuria**, and **hæmaturia**, with all the symptoms of **strangury**. After a large dose there may even be complete **suppression of urine**. The urine has a **smell of violets**.

Skin.—It is excreted by the skin, and sometimes causes **erythema**.

Temperature.—Turpentine is said to be a mild **antipyretic**, but occasionally it has the very opposite effect. Old oil of turpentine is an antidote to phosphorus (*see* p. 549).

THERAPEUTICS

Externally.—Turpentine *stupes* (flannels wrung out of very hot water and sprinkled with turpentine) are largely used to produce **irritant** or **counter-irritant** effects in various forms of **acute** and **chronic inflammation**, such as **pleurisy**, **bronchitis** and **osteo-arthritis**. The liniments are valuable applications to painful areas, as in **neuralgia**, **myalgia**, **rheumatism**, **lumbago**, and **unbroken chilblains**. Pure turpentine has been used as a **parasiticide** in the various forms of **Tinea**, and Fauls recommends the following plan, which he claims will cure **ringworm** in a week:—"Cut the hair and rub in turpentine until smarting is complained of, then wash with carbolic soap (1 in 10), dry the skin and paint on 2 or 3 coats of Tr. Iodi. Finally anoint the hair with carbolic oil (1 in 20)." Turpentine may also be used for the cure of **psoriasis** in cases where chrysophanic acid causes too much irritation. For this purpose the scales must first be removed by alkaline baths, and then a mixture of turpentine and olive oil (1 in 4) painted on. Afterwards gradually increase the proportion till the pure oil is used. On account of its property of constricting the vessels, turpentine is strongly recommended by Jacobson as a **hæmostatic** to check the free oozing that follows **removal of the jaw**, **excision of the tongue**, and many **operations about the mouth**, in which cases its antiseptic properties are also of value. The vapour also checks the bleeding in **hæmoptysis**, but the air of the patient's room must be saturated with it.

Note.—"Sanitas" fluid (*see* p. 454) is merely a watery solution of common turpentine which has been allowed to oxidize in the air. It is a pleasant non-poisonous disinfectant, and does not stain linen.

Internally. Gastro-intestinal tract.—In large doses (30 to 60 ms. every hour for a few hours) it is a valuable **hæmostatic** in **gastric ulcer**, and **typhoid fever**; whilst as an enema it is very efficacious in relieving **tympanitic distension of the abdomen**. Its use as an **anthelmintic** has already been described.

Circulation.—By reducing blood-pressure, it acts as a **hæmostatic** in **hæmoptysis**, but it should not be given in **hæmaturia** except in very small doses. It is invaluable in the hæmorrhages that accompany the **hæmorrhagic diathesis** and **purpura**.

Respiratory tract.—With the exception noted above, it is not much used as an inhalation, as Pumiline, Terebene, and Eucalyptus Oil are much more pleasant and less irritating. Given internally in small doses it is useful in **chronic bronchitis**, but terpene hydrate and terpinol are to be preferred. (N.B.—*Terpinol must not be confounded with Terpincol, which is a thick colourless alcohol contained in it, and sometimes used to disguise the smell of iodoform.*)

Genito-urinary system.—It has been given with benefit in **simple catarrh of the bladder, chronic cystitis, gonorrhœa, and gleet**; also as a diuretic, in **hepatic dropsy**.

Skin.—Its internal use has been recommended in **eczema, psoriasis, &c.**, where it acts by constricting the capillaries; for the same reason it is said to do good in **iritis and non-specific choroiditis**.

Caution.—Turpentine must always be given cautiously on account of its liability to set up strangury, and *it should never be given at all to the subjects of Bright's disease*, as in cases of this kind it may cause fatal suppression of urine.

TEREBINTHINA CHIA. Chian Turpentine

N.O. *Anacardiaceæ*. (Non-official)

Habitat.—Scio.

Source.—An oleo-resin obtained from the incised trunk of *Pistacia Terebinthus*.

Characters.—In solid tears, with an agreeable smell and taste, free from the bitterness and acidity of pinaceous turpentine. Both in taste and appearance it resembles Mastiche, which is obtained from *Pistacia lentiscus*. *Dose.*—5 to 10 grs.

NON-OFFICIAL PREPARATIONS

1. **Mistura Terebinthinæ Chiæ.**—Pulv. *Acaciæ* 5, Pulv. *Tragacanth* 1, Chian Turpentine 5, Ether 5, Distilled Water *q.s.* to 70. Triturate the three powders in a dry mortar, dissolve the turpentine in the ether, and mix with the powders; then add boldly water 10, and triturate till emulsified, afterwards adding water 40. Stir until the ether has evaporated and then transfer to a dry bottle, finally adding water to 70. *Dose.*—3 drs. daily, in divided doses, after food, gradually increased to 9 drs. Contains about 30 grs. in 1 oz.

2. **Pilula Terebinthinæ Chiæ, L.H.**—Chian Turpentine 3, Sublimed Sulphur 2, to which a little lycopodium may be added to preserve the shape. *Dose.*—Two every four hours.

3. **Pilula Terebinthinæ et Zinci.**—Chian Turpentine 4, Zinc Sulph. 1. Make one pill. *Dose.*—1 to 3 pills.

PHARMACOLOGY AND THERAPEUTICS

Chian turpentine was brought to the notice of the profession by Clay as a remedy for **cancer of the uterus**, in which disease he professed to have obtained marvellous results with this drug, but subsequent observations have shown that his statements are greatly

exaggerated and many physicians have therefore discarded it altogether. The writer, however, as the result of his personal experience can vouch that it is of considerable value, and that although it does not cure the malady, it distinctly checks its progress, improves the general condition of the patient, and lessens the factor of the discharges. It is best exhibited in the form of the mixture described above.

THEOBROMATIS OLEUM

Oil of Theobroma. N.O. *Sterculiaceae*

Syn.—*Cacao Butter*.

Habitat.—Demerara and Mexico.

Source.—By expression from the warm ground seeds of *Theobroma cacao*.

Note.—Chocolate is prepared from these seeds by roasting the kernels and afterwards adding sugar and vanilla. Cocoa is prepared by first expressing a portion of the oil, and then roasting and grinding.

Characters.—A yellowish, solid concrete oil, in cakes, with the consistency of tallow and smelling like chocolate. Taste agreeable. Does not turn rancid on exposure to the air. Melts at 86° to 95° F.

Composition.—(1) *Stearin*. (2) *Olein*. (3) An alkaloid, *Theobromine*, the composition of which is di-methylxanthin.

Enters into.—All suppositories except those of glycerin.

PHARMACOLOGY AND THERAPEUTICS

Because its melting-point is below that of the human body, oil of theobroma is used as the basis for all suppositories which are intended to slowly dissolve when introduced into the rectum.

Ichthyol suppositories require the addition of a little beeswax to give them consistency. In this country it is better to make up the suppositories as directed in the Pharmacopœia, keep them in water till required and put them on ice to harden before they are introduced into the rectum. By this means we can be sure that they will dissolve after introduction into the body.

NON-OFFICIAL PREPARATIONS OF THEOBROMINE AND ALLIED PURIN DERIVATIVES

1. **Diuretin, B.P.C.** *Syn.*—*Sodium-theobromine salicylate*.—This is closely allied to caffeine (theobromine is di-methyl xanthine, and caffeine is tri-methyl xanthine). A white powder, freely soluble in water, and containing 40 p.c. of theobromine and 60 p.c. of sodium salicylate. It is a valuable diuretic in cardiac and renal dropsy. Is stronger than caffeine, its effects last longer, toleration is not easily established, and it is less likely to cause insomnia. It however often causes diarrhoea and sometimes vomiting. Is said not to cause much depression, but serious effects have been known to follow three doses of 15 grs. each. *Dose.*—10 to 20 grs.

2. **Agurin.**—A *Sodio-acetate of theobromine*. A deliquescent powder easily soluble 1 in 2 of water. *Dose.*—7½ to 15 grs.

3. **Theocin.**—A synthetized preparation, having the composition of *Theophylline*, an alkaloid which exists in small quantities in tea and coffee.

It is isomeric with theobromine. An odourless crystalline powder, soluble 1 in 200 of water. A powerful diuretic. *Dose*.—3 to 6 grs.

4. **Iodo-theobromine**.—*Sodio-theobromine iodide*, containing 40 p.c. of theobromine in combination with sodium iodide and salicylate. Recommended in *cirrhosis of the liver* and *acute nephritis*. *Dose*.—2 to 10 grs.

5. **Uropherin**. *Syn.*—*Lithium-diuretin*.—See p. 487.

6. **Theophorin**.—A combination of theobromine with sodium formate. Soluble in water forming a clear weakly alkaline fluid, which precipitates theobromine on standing. Recommended by several French observers, not only for its diuretic properties but also for its general tonic effects. Experiments on animals have given good results, but clinical evidence of its value is not yet forthcoming.

PHARMACOLOGY AND THERAPEUTICS OF THE PURIN DERIVATIVES

These substances are called Purin Derivatives because they are derived from xanthine, one of the Purin bases, by the substitution of a certain number of atoms of methyl (CH_3) for atoms of Hydrogen. These are therefore closely related to uric acid, as will be seen from the formulæ given below :—

Purine	$\text{C}_5\text{H}_4\text{N}_4$.
Hypoxanthine	$\text{C}_5\text{H}_4\text{N}_4\text{O} = \text{Monoxypurine}$.
Xanthine	$\text{C}_5\text{H}_4\text{N}_4\text{O}_2 = \text{Dioxypurine}$.
Uric acid	$\text{C}_5\text{H}_4\text{N}_4\text{O}_3 = \text{Trioxypurine}$.
Theobromine	$\text{C}_5\text{H}_2(\text{CH}_3)_2\text{N}_4\text{O}_2 = \text{Dimethyl-xanthine}$.
Caffeine	$\text{C}_5\text{H}(\text{CH}_3)_3\text{N}_4\text{O}_2 = \text{Trimethyl-xanthine}$.

Theocin is isomeric with theobromine, the methyl-group in theobromine being in the 3-7, and in theocin in the 1-3 positions.

These closely allied substances differ in their therapeutic action. Caffeine stimulates the heart and has only a slight direct action on the kidneys. Theobromine acts much more powerfully on the renal epithelium; it also stimulates the heart and lowers blood-pressure by its action on the vaso-motor centres.

Theocin is a less powerful cardiac stimulant than caffeine but it is more active as a diuretic than either of the other two. The best results are obtained with theocin in **chronic interstitial nephritis** where there is always sufficient healthy kidney tissue left to respond to the drug. It is *contra-indicated in acute nephritis and in diffuse parenchymatous inflammation*. In cases where the kidney is embarrassed by either local or general obstruction, theocin and theobromine only act after the obstruction has been relieved by digitalis. This is an important point to bear in mind. All these diuretics, but specially theocin, increase the solid urinary constituents as well as the water. This places theocin amongst the most efficient of diuretics in cases of **œdema with retention of sodium chloride**.

Theobromine is usually given either as the double salt with sodium

salicylate (*diuretin*), or with sodium acetate (*agurin*). It is claimed for *agurin* that it is free from most of the unpleasant side-effects of *diuretin*, especially the depressing action of the salicylate, while the diuretic action is somewhat increased since the acetate itself possesses diuretic properties and the amount of theobromine contained in *agurin* is 10 p.c. more than in *diuretin*. It is uniformly well borne, and the administration can be kept up for several weeks, in which respect it possesses distinct advantages over either *diuretin* or *theocin*. It is most successful in cases of **dropsy due to myocardial degeneration**, complicated with nephritis, and even in uncomplicated cases.

Theocin is a very powerful diuretic and often acts where both of the above-mentioned combinations have failed: it may either be given alone, or in the form of double salts theophylline-sodio-salicylate or theophylline-sodio-acetate. It is very prompt in its action but the effects soon pass off and it cannot therefore be administered continuously for any length of time. It also produces certain unpleasant side-effects which must be carefully borne in mind. These effects are as follows:—

- (1) Symptoms of gastric disturbance; vomiting and diarrhoea.
- (2) Nervous symptoms; headache, vertigo and convulsions.

These effects are most likely to occur when pure *theocin* is used; hence the compound salts should be used in preference, and the following precautions should be observed:—

- (1) The daily dose should not exceed a total of 15 grs.
- (2) The drug must always be freely diluted and given on a full stomach.
- (3) It should only be given on alternate days, using either *diuretin* or *agurin* on the intervening day.
- (4) If the patient develops headache or sickness, the drug should be stopped immediately.
- (5) Never use *theocin* if there be acute nephritis or excessive destruction of kidney substance. Remember that it only acts when there are healthy kidney cells for it to act upon.

If these precautions are observed, there is little risk of causing convulsions or producing other untoward effects.

THUS AMERICANUM. *Frankincense*

N.O. *Coniferae*

Habitat.—Southern United States.

Source.—An oleo-resin scraped off the bark of *Pinus palustris* and *Pinus taeda*.

Characters.—Soft, yellow, opaque, tough solid, becoming darker, dry and brittle by keeping. Smells and tastes like turpentine.

Composition.—As other oleo-resins.

Action.—External stimulant.

Enters into.—Emplastrum Pici

PHARMACOLOGY AND THERAPEUTICS

It is not used internally, but is added to plasters on account of its mild stimulating effects and for its physical properties.

THYMOL. Thymol

Syn.—Thyme Camphor.

Habitat.—Britain and Asia.

Source.—A crystalline substance extracted with caustic soda from the volatile oils of *Thymus vulgaris* (N.O. *Labiatae*) and *Carum copticum* (N.O. *Umbelliferae*). Purified by recrystallization from alcohol.

Characters.—Large prismatic crystals, smelling like thyme, and with a burning, nauseous, aromatic taste. They sink in cold water, but melt and rise to the surface if the water be heated. **Solubility.**—1 in 1500 of cold water, 1 in 190 of glycerin, 1 in 2 of olive oil. Freely in alcohol, ether, and chloroform.

Composition.—It is a *phenol*, and exists in oil of thyme in combination with *cymene*.

Dispensing hints.—Thymol when rubbed with an equal weight of menthol, camphor, or phenol forms an oily liquid (*see* Menthol). When three parts of thymol are rubbed with two parts of chloral hydrate, a similar liquefaction takes place.

Action.—Antiseptic, parasiticide, and deodorant.

B.P. Dose.— $\frac{1}{2}$ to 2 grs., in pill.

NON-OFFICIAL PREPARATIONS

1. **Liquor Thymol.**—1 in 800 of warm water.
2. **Liq. Thymolis Co., B.P.C.** *Syn.*—*Liquor Antisepticus.*—Boric acid 2, Benzoic acid, thymol each .1, eucalyptol .025, oil of peppermint .05, oil of gaultheria .025, oil of thyme .01, alcohol 26.5, water to 100. *Dose.*— $\frac{1}{2}$ to 2 drs.
3. **Glycerinum Thymolis Co., B.P.C.** *Syn.*—*Glycerinum Thymolis Alkalinum.*—Anti septic and anticatarrhal wash.
4. **Ophthalmic discs,** each containing $\frac{1}{1000}$ gr. of thymol.
5. **Pastillus Thymolis, B.P.C.**—Each containing $\frac{1}{32}$ gr. of thymol.
6. **Spiritus Thymolis.**—1 in 10, with alcohol (90 p.c.). *Convenient for dispensing and for medicating the wool of antiseptic respirators.* *Dose.*—3 to 15 ms.
7. **Thymol Gauze,** containing 1 p.c. of thymol. *As an antiseptic dressing.*
8. **Voilekman's Thymol Solution.**—Thymol 1, alcohol 20, glycerin 20, dissolve and add to water 1000. *As a spray and antiseptic lotion.*
9. **Unguentum Thymol.**—In varying strengths from 5 to 30 grs. in 1 oz. of vaseline. The thymol must be dissolved in the basis by the aid of heat. 10 grs. to 1 oz. of vaseline is very useful for *keeping off mosquitoes.*
10. **Vapor Thymol.**—Thymol 6 grs., rectified spirit 1 dr., magnesium carbonas levis 3 grs., water to 1 oz. *As an inhalation.*
11. **Thymol Carbonate.** *Syn.*—*Thymotal.*—Is not dissolved in the stomach and therefore valuable as a remedy for *anchylostoma.* *Dose.*—5 to 15 grs.
12. **Thymaglycine.**—Sod. Benzoate 3, Glycerin 10, Thymol water 50 Water to 100, Liq. coci q.s. Used as a spray and mouth-wash, also for

vaginal irrigation. Given internally in *gastric and intestinal catarrh*.
Dose.—1 to 2 drs. per os.

13. Glycothymoline.—A proprietary article is said to consist of Pot. carbonate, sodium benzoate, sodium borate, smaller portions of sodium salicylate, thymol, menthol, glycerin, and alcohol, and coloured with cochineal.

PHARMACOLOGY AND THERAPEUTICS

Thymol is a very powerful antiseptic: a solution of the strength of 1 in 1000 stops all putrefactive or fermentative action in any fluid to which it is added. It is therefore more powerful than carbolic acid: it is also less apt to cause eczema, but its insolubility is a great drawback to its use. Volckman's solution, the gauze and the ointment are all employed in **antiseptic surgery** and the last mentioned is very useful in **parasitic skin diseases**, especially **tinea of the scalp or beard**. Burns washed first with a watery solution ($\frac{1}{2}$ gr. in 1 oz.) and then treated with an oleaginous solution ($\frac{1}{2}$ gr. in 1 dr.) heal rapidly. The pastils, spray and inhalation are useful in **laryngitis** and **pharyngitis**, and the solution may be employed as a lotion in **chronic ozæna**, **eczema**, and **psoriasis**; or as an injection in **leucorrhœa**.

Internally.—In large doses, thymol gives rise to very unpleasant symptoms, excitement, vertigo, &c., and the urine may become dark as in carbonic acid poisoning. In still larger doses the medullary and spinal centres are paralysed, collapse sets in, and there is a marked fall of blood-pressure and temperature before death. Its internal administration has been recommended in **typhoid fever**, **pleurisy**, **pneumonia**, **chronic cystitis**, and **diabetes**, whilst Bozzolo urges that it should be tried in **cholera**. Warren gives it in **diphtheria**, in combination with potassium chlorate, quinine, and brandy. Its chief value, however, is as an anthelmintic for **anchylostoma duodenale**, for which purpose it must be given in doses of 15 to 30 grs., repeated 3 or 4 times at intervals of an hour. When giving the drug in these large doses, the patient must keep his bed and lie down for several hours after the last dose; he must also be warned not to partake of alcohol or any other solvent of thymol as long as the drug is in his stomach, otherwise serious consequences may ensue. Thornhill relates an instance in which a fatal result was brought about, after two 30 gr. doses, by the neglect of these precautions.

Prescribing hints.—Thymol *must never be administered in solution*, as it causes a most unpleasant burning sensation of the mouth and throat, and is extremely irritating to the mucous membrane of the stomach. It should be given in pill, cachet, or emulsion. The emulsion is best made by dissolving the thymol in alcohol, and then precipitating it by pouring the alcoholic solution into **cold water**. A little mucilage may finally be added to keep the finely powdered thymol in suspension.

THYROIDEUM SICCUM. Dry ThyroidN.O. *Ruminantia***Syn.**—Thyroid Powder.

Source.—Prepared from the fresh and healthy thyroid of the sheep. The glands are taken from the sheep directly it is killed, all fat and connective tissue are removed, and the glands cut across. Any abnormal glands are rejected, and the healthy ones are minced, dried, powdered, and exhausted of fat by means of petroleum spirit.

Characters.—A light dull brown powder, with a faint meat-like odour, but no smell of putrescence.

Composition.—A proteid, *Thyroidin*, containing 9.3 p.c. of iodine and 0.5 p.c. of phosphorus. It exists in the colloid matter of the gland.

Dispensing hint.—It must be carefully preserved in dry stoppered bottles, as it will putrefy if it becomes damp.

Action.—Restorative in myxœdema and cretinism.

B.P. Dose.—3 to 10 grs.

LIQUOR THYROIDEI. Thyroid Solution

Source.—A fresh healthy sheep's thyroid is sliced. To this add 34 ms. each of glycerin and phenol solution (0.5 p.c.). Allow to stand for 24 hours, then strain, press, and add enough phenol solution to make it up to 100 ms.

Characters.—A pinkish turbid liquid, free from putrescence.

Dispensing hint.—It must be freshly prepared, and kept in well-stoppered bottles which have been sterilized before the fluid is poured into them.

B.P. Dose.—5 to 15 ms. (100 ms. represent one gland).

NON-OFFICIAL PREPARATIONS

1. **Ext. Thyroides Liquidum, B.P.C.**—This preparation is an improvement upon *Liq. Thyroides*. *Dose.*—3 to 15 ms.

2. **Iodothyryn.** *Syn.*—*Thyro-iodin*.—Prepared by extraction of the pancreatized gland by means of petroleum ether, solution in soda, and precipitation by sulphuric acid. *Dose.*—5 grs. (see p. 464).

3. **Thyrocoll.**—A similar preparation, isolated from the colloid material.

4. **Thyroglandin.**—A thyroid extract. *Dose.*—3 to 5 grs.

PHARMACOLOGY

Externally.—Nil.

Internally. **Circulation.**—It causes increase in the pulse-rate, palpitation and weakness of the heart's beat, whilst, as a result of its action on the vaso-motor centres, there is a fall of blood-pressure and the skin becomes warm and bathed in moisture. There is an increase in the number of lymphocytes in the blood.

Excretion.—It is chiefly excreted by the kidneys, but large doses may cause gastro-intestinal disturbances and diarrhoea.

Metabolism.—Here it has a very marked effect, and it causes greatly increased oxidation of all the tissues, so that an excess of urea, uric acid and xanthin bases is excreted by the kidneys, and more carbonic acid by the lungs. Consequently the temperature rises, and although the appetite increases the body weight falls.

Kidneys.—Thyroid is a diuretic, and may even cause glycosuria.

Nervous system.—Large doses sometimes cause tremors, restlessness and insomnia; and mania has been known to follow its use for the cure of obesity.

THERAPEUTICS

Thyroid gland may be exhibited in four ways, (1) by *feeding patients* with the lightly cooked glands, (2) by *grafting* pieces of the gland under the skin, (3) by *giving dry thyroid* in powders, cachets, or tabloids, or (4) by *giving thyroid solution*. The first two methods are now practically abandoned, and thyroid solution should always be used whenever possible as the dry thyroid is so apt to putrefy.

Its chief use is in the treatment of **myxœdema** which is a disease due to atrophy of the thyroid gland. Begin with 5 ms. three times a day, and gradually increase the dose until 10 ms. can be taken. In six weeks all symptoms will probably have disappeared, but to prevent recurrence the patient must take 10 ms. twice a week for the rest of his life. In the same way it acts like a charm in **cretinism**, which is a form of idiocy associated with dwarf-growth, due to congenital absence of the thyroid. Under this treatment however the bones of cretins have a strange tendency to bend. Thyroid has also proved of benefit in **congenital imbecility**, **tetany**, and the **insanity of the menopause**.

Serafine extols the thyroid treatment in certain forms of **goitre**, especially in **struma parenchymatosa**, but it is useless in **exophthalmic goitre**. It has been successfully used in the cure of ordinary **obesity**, but it is dangerous and cannot be recommended for this purpose. Various skin diseases have been benefited by it, as **psoriasis**, **pityriasis rubra**, **ichthyosis**, **eczema**, **lupus**, &c., whilst it sometimes causes a luxuriant growth of hair in **alopecia**.

Cheron used it as a **galactagogue** and in **threatened abortion**; and Gauthier reports successful result in the treatment of **ununited fracture**. Different observers have reported benefit from its use in **malignant syphilis**, **carcinomatous nodules** reappearing after operation, **acromegaly** and **leprosy**, and it is said to **assist the development of backward children**, and to control **hæmophilia**.

Iodothyrim and **thyrocoll**, which have been recently introduced, have not verified the claims made on their behalf. They are powerful alteratives, but they have very little value in cases where ordinary thyroid gland substance proves so efficacious. Iodothyrim acts powerfully on metabolism, and has the toxic properties of iodine.

TOXICOLOGY

Acute Thyroidism.—The symptoms produced by an overdose are as follows:—Rapid pulse, fever, headache, tendency to syncope, sickness, diarrhoea, restlessness, wandering pains, pruritus, and rarely delirium.

Chronic Thyroidism.—The symptoms are:—Loss of weight, muscular weakness and paresis, falling out of the hair, protrusion of the eyeballs, dilatation of the pupils with widening of the palpebral fissure, and finally death from malnutrition and asthenia. It will be noted that these symptoms closely resemble those of exophthalmic goitre.

TINOSPORA. *Tinospora*N.O. *Menispermaceæ*

(Ind. and Col. Addendum)

Syn. I. V.—*Gulantha*, Beng., Hind.

Habitat.—India and Eastern Colonies.

Source.—The dried stem of *Tinospora cordifolia*, collected during the hot season.

Characters.—Cylindrical, straight or twisted pieces, or in transverse sections. Bark shrunk, longitudinally furrowed and covered with round elevated scars, colour greenish-brown, not rough.

Composition.—(1) *Berberine*. (2) A non-crystallizable bitter glucoside. (3) A starch, known as *gilæ ka sat*.

Action.—A simple bitter.

OFFICIAL PREPARATIONS

1. **Infusum Tinosporæ.**—1 in 10. B.P. Dose.— $\frac{1}{2}$ to 1 oz.
2. **Liquor Tinosporæ Concentratus.**—1 in 20. B.P. Dose.— $\frac{1}{2}$ to 1 dr.
3. **Tinctura Tinosporæ.**—1 in 5. B.P. Dose.— $\frac{1}{2}$ to 1 dr.

PHARMACOLOGY AND THERAPEUTICS

Tinospora has **tonic, antiperiodic, diuretic, and alterative** properties. It is a pure bitter without tannin, and may be substituted for **calumba** in all cases in which that drug is indicated. It has a great reputation in India for the treatment of **mild intermittents, the debility of convalescence, secondary syphilis, and chronic rheumatism**. The fresh plant is given, mixed with milk, in **rheumatism, acidity of urine and dyspepsia**.

Gilæ ka sat, which is prepared by powdering the stem and extracting the starch with water, retains none of the bitterness of the drug. It is said to be an excellent remedy in **urinary affections and gonorrhoea**, and is also esteemed as a tonic **after fevers**, and in **splenic cachexia**. The dose is $\frac{1}{2}$ to 1 dr. taken with sugar, milk or rice gruel.

TODDALIA. *Toddalia*N.O. *Rutaceæ*

(Ind. and Col. Addendum)

Syn. I. V.—*Kartodali*, Beng. *Dāhanā*, Sans. *Jungli kulī mirch*, Hind.**Syn. Commercial.**—Lopez Root.**Habitat.**—India and Eastern Colonies.**Source.**—The dried root bark of *Toddalia aculeata*.**Characters.**—Quilled pieces covered with soft yellowish periderm, fissured longitudinally, and exhibiting a bright yellow layer and a deeper brown layer. It has a faint aromatic odour and an aromatic pungent taste.**Composition.**—(1) A resin and an essential oil, having a cinnamon-like odour. (2) A bitter principle, probably an alkaloid, with antipyretic properties.**Action.**—Aromatic tonic, carminative, antiperiodic (?).

OFFICIAL PREPARATIONS

1. **Infusum Toddaliæ.**—1 in 10. **B.P. Dose.**—1 to 2 ozs.2. **Liquor Toddaliæ Concentratus.**—1 in 2. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.

PHARMACOLOGY AND THERAPEUTICS

Its pharmacological actions resemble those of *cusparia* (q.v.) and it is largely used in the East as a **stomachic**, a **febrifuge**, and as a **seasoning for food**; also as a **carminative** in **dyspepsia** and **dysentery**.

It is also of value in **constitutional debility** and in **convalescence from febrile and exhausting diseases**.

The fruit and root, when rubbed down with oil, make an excellent stimulating application in **rheumatism**.

TRAGACANTHA. *Tragacanth*N.O. *Leguminosæ***Syn. Commercial.**—Syrian Tragacanth.**Habitat.**—Asia Minor.**Source.**—A whitish gummy exudation obtained by incising *Astragalus gummifer* and other species of *Astragalus*.

Characters.—Horny curved plates of varying sizes and shapes, somewhat translucent and marked with concentric rings. Very tough, and must be heated to 120° F. before it can be powdered. Without smell or taste. **Solubility.**—Sparingly in cold water, which converts it into a gelatinous mass, coloured violet by Tr. Iodi. **Impurities.**—Other gums.

Identification.—Resembles *Scilla*, which is thicker and opaque.

Composition.—(1) A gum, *Tragacanthin*, 33 p.c., only slightly soluble in water, unfermentable. (2) A gum resembling the *Arabin* of acacia,

53 p.c., soluble in water, from which it is precipitated by lead acetate or ferric chloride. (3) A little starch.

Enters into.—Conf. Sulphuris, Mist. Cretæ, Mist. Guaiaci, Pil. Ferri, Pil. Quininae Sulph., Pulv. Opil Co., and the

OFFICIAL PREPARATIONS

1. **Glycerinum Tragacanthæ.**—1 in 5.
2. **Mucilago Tragacanthæ.**—1 in 80, Alcohol (90 p.c.). *Enters into.*—Lotio Hydrarg. Nigra.
3. **Pulvis Tragacanthæ Compositus.**—1 in 6. **B.P. Dose.**—20 to 60 grs.

NON-OFFICIAL PREPARATIONS

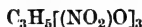
1. **Gelanthum (Unna).**—Tragacanth 110 grs., Gum 30 grs., Gelatin 120 grs., Distilled Water 10 ozs. Heat in a steam-bath for 4 hours, press through muslin, mix well, and add Glycerin 6 drs. Heat again in a water-bath for an hour, and add distilled water (containing in solution Thymol $\frac{1}{4}$ gr.) q.s. to 12 ozs. Used as a basis for various drugs in skin medication.

2. **Linimentum Exsiccans, B.P.C.** *Syn.* — *Bassorin Paste.* — Tragacanth 5, Glycerin 2, Alcohol (90 p.c.) 10, Water to 100. Dries quickly on the skin, producing a pleasant cooling sensation. May be medicated with any drug. St. John's Hospital for Skin Diseases has the following "*Bassorins*" in use:—Boric Acid 10 p.c., Salicylic Acid 5 p.c., Chrysarobin 5 p.c., Hydronaphthol 5 p.c., Ichthyol 30 p.c., Resorcin 30 p.c., Precipitated Sulphur 30 p.c., Thioresorcin 5 p.c.

PHARMACOLOGY AND THERAPEUTICS

In the form of Unna's Gelanthum, or the various "*Bassorins*," tragacanth is very useful in the treatment of many **skin diseases**. It is a **demulcent**, and the official glycerin is a soothing application in **sore throat**, but its chief use is to **aid the suspension of heavy insoluble powders** in mixtures. As a rule the mucilage is to be preferred to the compound powder which, on account of the starch it contains, is apt to ferment. The powder however is especially useful for suspending the nitrate of bismuth.

TRINITROGLYCERIN. B.P.C. (*Non-official*)



Syn.—*Nitroglycerin, Trinitrin, Glonoin oil, Nobel's blasting oil.*

Source.—By dropping glycerin into an ice-cold mixture of nitric and sulphuric acids; but the latter acid merely acts by absorbing the water, which is given off, thus:— $\text{C}_3\text{H}_5(\text{OH})_3 + 3\text{HNO}_3 = 3\text{H}_2\text{O} + \text{C}_3\text{H}_5(\text{NO}_3)_3$.

Characters.—A colourless, oily liquid. Sp. gr. 1.6, slightly soluble in water, easily in fats, oil, alcohol, and ether. Highly explosive. When mixed with silica, it forms dynamite.

Composition.—It is a *Nitrate of Glyceryl*.

Action.—Relieves arterial spasm. *Dose.*— $\frac{1}{100}$ to $\frac{1}{50}$ gr., but never undiluted.

OFFICIAL PREPARATIONS

1. **Liquor Trinitrini.**—1 gr. in 110 ms. **B.P. Dose.**— $\frac{1}{2}$ to 2 ms.
2. **Tabellæ Trinitrini.**— $\frac{1}{100}$ gr. in each, with a chocolate basis to avoid risk of explosion. **B.P. Dose.**—1 to 2 tablets.

NON-OFFICIAL AND ALLIED PREPARATIONS

1. **Injectio Nitroglycerini Hypodermica.**—Liq. Trinitrini 5, alcohol (90 p.c.) 2, distilled water to 12. *Dose*—1 to 4 ms.
2. **Haustus Trinitrini** (Vict. Park).—Liq. Trinitrini 1 m., Tr. Chloroform. Co. 10 ms., Pimento Water to $\frac{1}{2}$ oz. *Dose.*— $\frac{1}{2}$ to 1 oz.
3. **Oleum Nitroglycerini.**—1 p.c. in almond oil. *Dose.*—1 or 2 ms., on sugar.
4. **Pilula Nitroglycerini.**—Containing $\frac{1}{10}$ to $\frac{1}{100}$ gr., with Oleum Theobromæ as a basis.
5. **Tabellæ Nitroglycerini Compositæ.**—Nitroglycerin $\frac{1}{100}$ gr., Amyl nitrite $\frac{1}{2}$ gr., Menthol $\frac{1}{10}$ gr., Capsicum $\frac{1}{100}$ gr.
6. **Erythrol Tetranitrate, B.P.C. Syn.**—*Tetranitrin, Nitroerythrit.*—Formed by dissolving erythrol (*sec p.* 282) in fuming nitric acid and precipitating by sulphuric acid. Hard, colourless, tasteless acicular crystals, nearly insoluble in water. *Dose.*— $\frac{1}{2}$ to 1 gr., increased to 3 grs. or more.
7. **Tabellæ Erythrol Nitratis**, containing $\frac{1}{2}$ or 1 gr., chocolate basis.
8. **Mannitol Nitrate. Syn.**—*Hexanitrin, Nitro-mannite.*—In light acicular quinine-like crystals. More explosive than Erythrol, but not so costly. Is liable to decomposition. *Dose.*—1 gr., increased.
9. **Tabellæ Mannitol Nitratis**, containing 1 gr. chocolate basis.
10. **Tabellæ Nitroglycerini et Strychninæ.**—Nitroglycerin $\frac{1}{100}$, $\frac{1}{120}$, $\frac{1}{150}$ gr. with strychnine $\frac{1}{100}$, $\frac{1}{120}$, $\frac{1}{150}$ gr.

PHARMACOLOGY AND THERAPEUTICS

Nitroglycerin is **nitrate**, but after absorption it is **converted into a nitrite** in the body, a change which also occurs if it is digested with blood outside the body. According to Hay, the astonishing activity of so small a dose as $\frac{1}{100}$ gr. is due to its **being absorbed unaltered by the stomach**, which decomposes to a large extent the ordinary nitrites, and the *nascent* nitrous acid formed by its final decomposition in the blood and tissues exerts a more incisive action than the nitrous acid of a nitrite. Its action is the **same as that of amyl nitrite** (*q.v.*), but the effects of nitroglycerin, **though not so prompt, are more lasting** than those of amyl. For this reason, in the treatment of **angina pectoris**, nitroglycerin **should be given in the intervals between the attacks** with the object of curing the disease, whilst the inhalation of amyl nitrite should be

reserved for the actual onset of the paroxysms. One of the drawbacks to the use of this drug is the fact that it is apt to cause a severe throbbing headache. This may be avoided by adopting the plan recommended by Whitla, who directs his patients to break up each tablet into 8 or more portions, and to take one of these portions every 15 or 20 minutes during the day. Of course, if an attack be impending, a large dose should be given at once, and the effect kept up by small ones. Patients rapidly become habituated to nitroglycerin, and the dose may be gradually increased until as many as 3, 4, or 6 tablets are taken when an attack of angina is threatening.

It has been successfully used for the purpose of lowering arterial tension in Bright's disease, where its slower and more permanent action is particularly valuable: for the same reason it is given for the weak heart of fatty degeneration and of old people. Its virtues have been extolled in epilepsy, sciatica, neuralgia, tinnitus aurium, puerperal eclampsia, asthma, and migraine. It has been given with elaterin in myxœdema, and to cut short attacks of renal and hepatic colic, and ague. It has been strongly recommended as a substitute for brandy, on account of its small dose and prompt action, in the collapse of cholera or that following chloroform inhalation, in shocks from accidents, and in faintness after surgical operations. It is worthy of a trial in dysmenorrhœa. It also gives great relief in senile restlessness.

It will often prevent sea-sickness, and if the treatment be commenced after sickness has already occurred, the patient may continue to vomit but the horrible feelings of nausea and depression disappear, and the physiological effect of the drug does not occur. It must however be given cautiously, and for administration to ladies, delicate persons, or children, the treatment should be commenced with doses of $\frac{1}{200}$, $\frac{1}{100}$, or $\frac{1}{50}$ of a grain.

It is as a rule a perfectly safe drug and even children have taken large doses without ill-effects. If symptoms of poisoning occur, strychnine, ergot and belladonna are recommended as antidotes.

Erythrol nitrate, being less powerful than amyl nitrite or nitroglycerin, is the best of the group for Bright's disease: it is, however, very costly.

TURPETHUM. Turpeth

N.O. *Convolvulacæ*. (Ind. and Col. Addendum)

Syn. I. V.—*Teuri*, Beng. *Tarbad*, Hind.

Habitat.—India, Eastern and American Colonies.

Source.—The dried root and stem of *Ipomœa turpethum*.

Characters.—In short pieces, $\frac{1}{2}$ to 2 in. in diameter, from which the central woody portion is usually removed. Externally dull grey, with a twisted rope-like or columnar appearance, odour faint.

Composition.—(1) A resin, *Turpethin*, which is a glucoside resembling convolvulin, the active principle of Jalap. The root contains 10 p.c. (2) A fatty substance. (3) A volatile oil. (4) Albumen, starch, yellow colouring matter, lignin, salts, and ferric oxide.

Action.—Drastic purgative.

B.P. Dose.—5 to 20 grs. in powder.

OFFICIAL PREPARATION

1. *Tinctura Jalapæ Composita*. B.P. Dose.— $\frac{1}{4}$ to 1 dr. (See p. 477).

PHARMACOLOGY AND THERAPEUTICS

As a **purgative** it is *equal to jalap and superior to rhubarb*; it has moreover a great advantage over both these drugs in that it is free from nauseous smell and taste. It also acts very efficiently when given alone. It is often necessary to give it in larger doses than jalap, but this is no disadvantage. It has been in use in India as a **cathartic** from a very early date, and has a great reputation in **rheumatic and paralytic affections**. When combined with chebulic myrobalans, it is said to be useful in **melancholia and dropsy**. The usual method of administration is to rub down about a drachm of the root or stem with water and add to it some rock-salt and ginger, or sugar and black pepper.

TYLOPHORÆ FOLIA. *Tylophora* Leaves

N.O. *Asclepiadaceæ*. (*Ind. and Col. Addendum*)

Syn.—Country Ipecacuanha.

Syn. I. V.—*Auntmul*, Beng. *Antmul*, Hind.

Habitat.—India and Eastern Colonies.

Source.—The dried leaves of *Tylophora asthmatica*.

Characters.—Petiolate, entire, 2 to 5 in. long, $\frac{3}{4}$ to 2 $\frac{1}{2}$ in. wide, broad, ovate abruptly acuminate, leathery, upper surface glabrous, lower downy. Colour brownish-green.

Composition.—Contains a crystalline alkaloid, *Tylophorine*.

Action.—Emetic, expectorant.

B.P. Dose.— $\frac{1}{4}$ to 2 grs. as an expectorant; 15 to 30 grs. as an emetic.

PHARMACOLOGY AND THERAPEUTICS

Its action is precisely the same as that of ipecacuanha (*q.v.*) and it has been used with great success in the treatment of **dysentery**. It is also a useful **expectorant** and **diaphoretic** in **catarrhal affections**. Half a teacupful of the infusion makes an excellent emetic for children in croup.

URANII NITRAS. $\text{UO}_2(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$

Characters.—Large lemon-yellow slightly efflorescent prismatic crystals. Has an astringent styptic taste. Soluble in half its weight of water. Possesses radio-active properties.

Action.—Influences carbohydrate metabolism. *Dose.*—1 to 5 grs., but must be given with caution.

NON-OFFICIAL PREPARATION

1. **Uranii et Quininae Chloridum.**—Minute yellow granular crystals. Soluble 1 in 100 of water. *Dose.*—3 to 6 grs.

PHARMACOLOGY AND THERAPEUTICS

It is an antiseptic but is too costly to be used for that purpose. Upon muscle uranium salts have a similar action to that of barium or veratrine.

May be used as an astringent wash for **indolent ulcers** in strengths of 2 grs. to the oz. of water, and an injection of 5 grs. to the oz. is useful in **gonorrhoea**. Internally it is given in **diabetes** and **phthisis**, when it nearly always causes the patient to gain in weight. It has been suggested as a remedy for **cancer** and **gout**.

URARI. B.P.C.

(Non-official). N.O. *Loganiaceae*

Syn.—*Curare, Ourari, Wourara, Wourali.*

Habitat.—South America.

Source.—The South American arrow-poison, prepared from the bark and sapwood of *Strychnos toxifera, cogens*, and *Schomburgkii*; together with *Cocculus* and other plants.

Characters.—A blackish-brown dry extract, with a bitter taste. Contains some resin, but is almost entirely soluble in water.

Composition.—The active principle is *curarina* or *curarine*, a most powerful poison. It exists as a brown powder, or deliquescent prisms, with an intensely bitter taste, soluble in water and alcohol, the latter solution being slightly fluorescent. Is not alkaline in reaction and forms no true salts.

Tests.—It resembles strychnine in giving the characteristic play of colours, from blue to cherry-red, when treated with sulphuric acid and potassium bichromate; and differs in being coloured red by a solution of sulphuric acid alone, which has no effect on strychnine. The physiological test however is more valuable than the chemical.

Action.—Paralyses the end-plates of the motor nerves.

Dose.— $\frac{1}{10}$ to $\frac{1}{2}$ gr., hypodermically.

NON-OFFICIAL PREPARATIONS

1. **Injectio Curaræ Hypodermica, B.P.C.**—5 grs. to 1 dr. *Dose.*—1 to 6 ms.

2. **Lamellæ**, containing either $\frac{1}{10}$ gr. of curarine or $\frac{1}{20}$ gr. of curare.

PHARMACOLOGY

Nervous system.—It paralyzes the terminal organs of the motor nerves, its chief action, according to Pollitzer, being upon the cementing substance between the nerves at the nodes of Ranvier. It has no effect upon the conductivity of the trunks of the nerves, or upon the reflex excitability of the spinal cord. The sensory nerves are unaffected by curare. It stimulates the secretory nerves, and causes excessive secretion of the lachrymal glands, of saliva, and of urine.

Circulation.—Small doses have very little effect; in larger doses the pulse becomes weak and frequent and there is a fall of blood-pressure due to general dilatation of the systemic arterics. These effects are brought about by paralysis of the vagus and vasomotor nerves.

Sugar appears in the urine of animals poisoned by curare. **Respiration** is interfered with owing to the paralysis of the respiratory muscles. There is also a considerable fall in temperature, and a diminution in the consumption of oxygen and formation of carbonic acid. Curare, as a rule, *only produces its physiological effects if given hypodermically*, and when taken into the stomach soon after food no results are observed. This is due to the fact that it is excreted by the kidneys more quickly than it is absorbed from the stomach. If the stomach be quite empty, or if the ureters be tied before the poison is administered, its full effect is produced. The urine of animals that have been placed under curare will poison other animals.

THERAPEUTICS

Curare is chiefly used in the physiological laboratory, but it is also one of the most valuable drugs we possess for the treatment of **tetanus**, in which disease an adult can take as much as 4 grains in the 24 hours, by hypodermic injection, without ill-results occurring therefrom. It has been recommended as a palliative in **hydrophobia**, and is said to be of value in **chorea**, and **epilepsy**.

Prescribing hints.—Curare must be carefully preserved from damp, which rapidly causes it to lose its potency. Whenever possible the active principle curarine should be used in preference to curare which is a generic name for a collection of various poisons, of uncertain strength. Remember that curare must always be administered hypodermically; for the reasons given above it is almost inert when given by the stomach.

Caution.—When a patient is taking full doses of curare, he should be carefully watched for symptoms of respiratory paralysis, and *tracheotomy instruments should always be kept in readiness*. Directly respiration fails, tracheotomy must be performed and artificial respiration kept up as long as may be necessary. Artificial respiration without a preliminary tracheotomy is useless, as the paralyzed vocal cords fall together and

prevent the air from entering the lungs. At the same time the bladder must be emptied by the catheter to prevent reabsorption of curare which has been excreted with the urine, and stimulants must be exhibited to counteract the depressing effect of the drug upon the heart through the vagus.

UREA. . B.P.C.

$\text{CO}(\text{NH}_2)_2$. (*Non-official*)

Syn.—*Carbamide*.

Source.—It may be prepared by evaporation from ammonium cyanate, with which it is isomeric; or may be built up synthetically in various ways.

Characters.—Silky four-sided prisms, or delicate white needles, has no action on litmus, odourless, taste bitter and cooling like saltpetre.

Solubility.—Readily in water, but insoluble in ether.

Composition.—It is a *diamide of carbonic anhydride*, and may be regarded as one molecule of carbonic anhydride plus two molecules of ammonia, deprived of one molecule of water.

Action.—Diuretic. *Dose.*—5 to 20 grs.

NON-OFFICIAL PREPARATIONS

1. **Urea Quinine.**—See p. 344. Hypodermically, in *cholera*.

2. **Ursal.**—A combination of urea with salicylic acid, in white acicular crystals partially soluble in water, readily so in alcohol. Used in *gout* and *rheumatism*. *Dose.*—10 to 30 grs.

3. **Veronal, B.P.C.** *Syn.*—*Diethyl-malonyl-urea*.—A white crystalline powder not very soluble in cold water. A powerful hypnotic. *Dose.*—4 to 15 grs.

4. **Proponal.**—*Dipropyl-Barbituric Acid*.—A white crystalline powder, very slightly soluble in water. *Hypnotic*. *Dose.*—2 to 8 grs.

5. **Bromural.**—*A Brom-iso-Valerianyl Urea*.—Colourless crystals, in soluble in water. *Hypnotic*. *Dose.*—5 to 10 grs.

PHARMACOLOGY AND THERAPEUTICS

The researches of Klemperer and Mering have shown that urea has the power of dissolving uric acid and enormously increasing the amount of urine. It has been strongly recommended as a preventive and cure of **uric acid calculi**, and as a diuretic in **cirrhosis of the liver**, **gouty affections** and **chronic kidney diseases**. For the latter purpose the daily dose at first is 2 drs., increased later to 4 or 5 drs.

For the solution of calculi, half a teaspoonful four times daily of a mixture of equal parts of urea, sodium bicarbonate, and calcium carbonate is recommended.

Urea also has a distinct antiperiodic effect in **ague**. The chief interest however in this drug centres, at the present time, in its alleged value as a remedy for **pulmonary phthisis**. In the hands of Haro it has yielded the most marvellous results, but the writer is bound to confess that after an extended trial on carefully selected cases

both in hospital and private practice, he has been bitterly disappointed in it, and is of opinion that, whatever may be its value in temperate climates, *it is of little or no use in the hot steamy atmosphere of Calcutta.*

Veronal is now coming into great favour as a **hypnotic**. It is four times as strong as sulphonal and it is very safe, as it does not affect the heart or respiration. It should not however be given continuously but should be used alternately with some other hypnotic. It is recommended in **insomnia of the insane, tetany, whooping-cough** and as an **anhydrotic in phthisis**. Several cases of veronal poisoning have occurred, the symptoms being thirst, itching of the skin and an erythematous eruption. It is an antispasmodic in **amyotrophic lateral sclerosis**, and good results are reported in tremors of disseminated sclerosis, hemiplegia, neurasthenia and cerebral tumour.

URETHANE. B.P.C.

(Non-official)

Syn.—*Ethyl-urethane.*

Source.—Prepared by the action of urea nitrate on ethylic alcohol.

Characters.—Colourless prismatic crystals, tasting like nitre, having no smell. Easily soluble in water.

Composition.—It is *ethyl carbamate*.

Action.—Hypnotic. **Dose.**—15 to 30 grs., in tablet or cachet.

NON-OFFICIAL PREPARATIONS

1. **Euphorine.** **Syn.**—*Phenyl-urethane, Carbanilic Ether.*—In white acicular crystals, slightly soluble in water, freely so in alcohol, with a faint clove-like odour and slightly acid taste. Antipyretic, analgesic, antiseptic, and antirheumatic. **Dose.**—3 to 6 grs., in sherry, or tablets.

2. **Hedonal.** **Syn.**—*Methyl-propyl-carbinol Urethane.*—It is the urethane of a secondary amyl alcohol. In white, micro-crystalline powder, with a saline taste, slightly soluble in water, more so in dilute alcohol. Hypnotic. **Dose.**—15 to 30 grs., in cachet or suspended in water.

3. **Somnal.** **Syn.**—*Ethyl-chloral-urethane.*—A colourless liquid, with a faint chloral-like odour, formed by the combination of alcohol, chloral, and urethane. Hypnotic. **Dose.**—30 to 45 ms., in sherry.

4. **Ural.** **Syn.**—*Uralium, Chloral-urethane.*—A combination of chloral and urethane, in colourless shining lamellar crystals with a bitter taste. Hypnotic. **Dose.**—20 to 60 grs., in syrup flavoured with an essential oil to disguise its bitter taste.

5. **Neurodin.** **Syn.**—*Acetylpara-oxyphenyl-urethane.*—Colourless, odourless crystals. Antipyretic and antineuralgic. **Dose.**—5 to 15 grs.

6. **Thermodin.** **Syn.**—*Acetylpara-ethoxy-phenyl-urethane.*—Colourless, tasteless crystals. Antipyretic. No unpleasant symptoms. **Dose.**—5 to 15 grs.

PHARMACOLOGY AND THERAPEUTICS

Urethane was introduced as a hypnotic by Schmiedeberg, who considered that the alcohol radical would affect the cerebrum whilst

the amidogen would stimulate the medulla and cord, and thus it would be free from danger to respiration and the heart. It retards digestion but does not disorder the stomach. At first it produces some excitement, but this is quickly followed by natural sleep, with some slowing of respiration and the pulse. Blood-pressure is not lowered, but large doses depress the temperature and weaken, and even abolish the reflexes. It does not relieve pain. It must be given in full doses of 20 to 30 grs, which may be repeated in an hour or two if sleep does not follow the first dose. It is specially suitable for children, cases of **delirium tremens** and **acute mania** and in the **insomnia of heart disease**. It is **antagonistic to strychnine**, and has proved more useful than chloral in tetanus.

Euphorine appears to combine the properties of salicylic acid and antifebrin. It retards alcoholic fermentation and destroys pathogenic and other bacilli. Large doses weaken the pulse and respiration and lower the temperature, but do not affect the heart or blood-pressure. It has been used in much the same doses as antifebrin (8 grs.) in **fevers, neuralgia** and **migraine**. Sanson gave it in 20 to 30 grain daily doses in **acute rheumatism, sciatica, orchitis**, and other painful febrile affections. The powder is a very useful application for **chronic ophthalmia**, and both the powder and ointment are very efficacious in checking suppuration and removing foul odours in **syphilitic ulcerations**. It has been much praised in **gynaecological practice**.

Its antipyretic effect is prolonged and accompanied by profuse sweating. A dose of 8 grains is equivalent to 10 grains of antipyrin.

Hedonal is used as a hypnotic in **neurasthenia** and **hysteria in women**. It is safe and free from ill-effects, and will produce a sleep of seven hours' duration.

Somnal was introduced as a hypnotic by Radlauer, who claims for it that it does not interfere with the digestion, respiration or circulation. Its effects begin in 30 minutes and it produces sound refreshing sleep, lasting from 6 to 8 hours, but it has yet to be proved that it is free from the dangerous depressing effects of chloral upon the heart.

Ural was introduced as a hypnotic by Bischoff and Poppi, and it is claimed for it to be rapid in its action and free from unpleasant results as the urethane is said to counteract the depressing effect of chloral. On the other hand it is uncertain in its effects, is unpleasant to take, and it has been found to reduce the blood-pressure, and to be frequently followed by nausea and disorders of digestion.

URGINEA. Indian Squill

N.O. *Liliaceæ*. (*Ind. and Col. Addendum*)

Syn. I. V.—*Jungli Peaj*, Beng., Hind.

Habitat.—India and Eastern Colonies.

Source.—The younger bulbs of *Urginea indica*, taken soon after the plant has flowered.

Characters.—Bulbs with fleshy tunicated coats, varying greatly in size, colour whitish, taste bitter and acrid.

Composition.—Similar to that of *Scilla* (*q.v.*).

Action.—Diuretic, expectorant.

OFFICIAL PREPARATIONS

Six in number, resembling both in composition and dosage those of *Scilla*.

PHARMACOLOGY AND THERAPEUTICS

Urginea has precisely the same action and uses as *scilla* (*see* p. 608).

UROTROPIN. B.P.C. $C_6H_{12}N_4$

(Non-official)

Syn.—*Formine, Aminoform.*

Source.—By acting on ammonia with formalin.

Characters.—Colourless granular crystals, with an alkaline reaction. Easily soluble in water, less soluble in alcohol, and almost insoluble in ether.

Composition.—It is *hexamethylenetetramine*.

Action.—Diuretic, lithontriptic, urinary antiseptic.

Dose.—5 to 15 grs.

NON-OFFICIAL AND ALLIED PREPARATIONS

1. **Formaldehyde, B.P.C.** *Syn.*—*Formal, Formic Aldehyd.* C_2H_4O .—A gas. An aqueous solution, containing 40 p.c. of the gas, is known as *Formalin*, or *Formol*.

2. **Amyloform.**—By the action of formaldehyde on starch. An inodorous, insoluble, white powder, unaltered by heat. Used as an *antiseptic dressing for wounds*.

3. **Formoform.**—A dusting powder composed of formaldehyde, thymol, zinc oxide, and starch.

4. **Dextroform.**—A compound of dextrin and formaldehyde. Used as an antiseptic, especially useful in *gonorrhœa*.

5. **Glutol.** *Syn.*—*Formalin-gelatin.*—As an antiseptic dressing for *burns, cavities, and suppurating ulcers*.

6. **Paraform, B.P.C.**—A polymer of formaldehyde, in white friable amorphous masses, slightly soluble in water, and with an irritating vapour. Heated in an enclosed spirit-lamp, it sublimes, unites with the products of combustion, and is converted into formaldehyd. Has been recommended as a *disinfectant for the sick-room after illness*.

7. **Chinotropine.** *Syn.*—*Urotropine Quinate.*—Contains quinic acid 73 p.c. and urotropine 23 p.c. A uric acid solvent. *Dose.*—Up to 90 grs. daily.

8. **Tannopine.** *Syn.*—*Tannol.*—A compound of tannin and urotropin. A brown tasteless odourless powder, insoluble in water, but soluble in dilute alkaline solutions. As an antiseptic and astringent in *urinary ailments, in tubercular ulceration and typhoid diarrhœa*. *Dose.*—15 grs.

9. **Piperazine, B.P.C.** *Syn.*—*Diethylene diamine, Dispermine.*—Formed by the action of sodium glycol on ethylene-diamine hydrochloride. In small colourless deliquescent crystals, with a strongly alkaline reaction,

saline taste, and faint odour. Soluble 4 in 7 of water. Dissolves twelve times as much uric acid as lithium carbonate. Dose.—5 to 15 grs.

10. **Lycetol.**—*Dimethyl-piperazine Tartrate.*—In gout and rheumatism. Dose.—15 to 30 grs.

11. **Lysidine.**—*Ethylene-ethenyl-diamine.*—A colourless liquid, recommended in uric-acid diathesis. Dose.—10 to 30 ms.

12. **Sidonal.**—*Piperazine Quinate.*—White crystalline granules. A uric acid solvent in gout and allied affections. Dose.—80 grains daily during pain.

13. **Hetralin.** *Syn.*—*Dioxybenzol-Hexamethylene-tetramine.*—*Crystalline needles.* Soluble 1 in 10 of water. A very powerful urinary antiseptic, preferable in many ways to urotropin. Dose.—7½ to 30 grs.

14. **Helmitol.** *Syn.*—*Formamol, B.P.C.*—A citrate combination of urotropin and formaldehyd. A more powerful antiseptic than urotropin and never causes irritation of the urinary apparatus. Dose.—7½ to 15 grs.

15. **Cystopurin.** *Syn.*—*Hexamethylinetetramine Sodium Acetate.*—Used in gonorrhœa. Dose.—30 grs.

16. **Borovertin.** *Syn.*—*Hexamethylinetetramine Triborate.*—Urinary antiseptic in gonorrhœal cystitis, pyelitis, and tuberculosis of bladder and kidneys. Dose.—15 to 60 grs. daily.

PHARMACOLOGY AND THERAPEUTICS

Urotropin and *piperazine*, with their derivatives, are valuable **diuretics** and **solvents of uric acid**. Urotropin, which is decomposed in the blood into ammonia and formaldehyd, is also a **urinary antiseptic**, and on this account is given in **typhoid fever** to lessen the chance of cystitis. Piperazine is now a favourite remedy for gout, and is rapidly supplanting lithia. Sir William Roberts (Croonian Lectures) concluded as a result of his experiments that neither lithium salts nor piperazine had the slightest effects in promoting the solubility of sodium biurate or preventing the formation of uratic deposits in gout.

Being very deliquescent, it is best given in the granular effervescent form or dissolved in soda water (15 grs. to each bottle). It is said to inhibit the transformation of glycogen into sugar in **diabetes**, and also to be very useful in the treatment of **renal colic**.

Formalin is a **caustic**. When diluted with ten times its bulk of water, it is useful as a **hardening histological agent** or as a **preservative for museum specimens**. It is a **powerful antiseptic**, and is used for **sterilizing instruments** and the **preservation of corpses for dissection**, but on account of its necrotic action on the skin it is not suitable for wound treatment. It causes **soft corns** to shrivel up.

Formalin 1, water 500 may be used as a mouth-wash in **stomatitis**, and a 1 p.c. solution is useful as a spray in **diphtheria** and **whooping-cough**. A 30 p.c. solution in glycerin makes an excellent pigment in **ringworm** and **parasitic skin diseases**.

Applied to **sarcomata** and **bleeding tumours**, it hardens their

substance and facilitates their removal. It also lessens the foetid smell in **bromidrosis of the feet**.

It has been strongly recommended as an antiseptic inhalation in **phthisis**, and Maguire (Harveian Lectures for 1900) has recently introduced a method of treating this disease by the intravenous injection of formaldehyd dissolved in normal saline solution (1 in 200). This solution is prepared by Messrs. Squire and Co. under the name of "*Hæmasepsin*." A 20 p.c. solution has been recently introduced under the names of *Holzine* and *Sterisol* for domestic use as an antiseptic for the sick-room, utensils, &c.

Paraform is used to disinfect rooms after illness: it requires a special apparatus which is known as the "*Formogene*" or "*Alformant*" lamp. The vapour of formaldehyde thus produced has been shown to disinfect surfaces only, it does not penetrate or disinfect fabrics.

UVÆ URSI FOLIA. Bearberry Leaves

N.O. *Ericaceæ*

Habitat.—England.

Source.—The dried leaves of *Arctostaphylos uva-ursi*.

Characters.—Yellowish-green, obovate, entire, coriaceous, shining leaves about $\frac{1}{2}$ to $\frac{3}{4}$ in. long, reticulated beneath; with an astringent taste and have a toothed margin.

Adulteration.—Red whortleberry leaves, which are dotted beneath and have a toothed margin.

Identification.—Bearberry leaves are said to resemble those of *Senna* and *Buchu*, but are easily distinguished by their obovate shape, leathery consistency, and the characteristic reticulation beneath.

Composition.—(1) Two bitter crystalline glucosides, *Arbutin* and *Ericolin*.—The former splits up into glucose, hydroquinone, and methylhydroquinone. (2) A tasteless neutral body, *Ursone*. (3) Tannic and gallic acids, 33 p.c.

Incompatibles.—Salts of lead and silver, iron, alkaloids, and gelatin.

Action.—Diuretic, urinary antiseptic.

OFFICIAL PREPARATION

1. **Infusum Uvæ Ursi.**—1 in 20 of boiling water. **B.P. Dose.**— $\frac{1}{2}$ to 1 oz.

PHARMACOLOGY

Bearberry leaves owe their properties to the glucoside *arbutin*, which at the time of its excretion by the kidneys is converted into *hydroquinone*, thus acting as a powerful **diuretic** as well as an **astringent** and **disinfectant to the urinary mucous membrane**. It may also colour the urine a dark greenish brown, similar to that seen in carbolic acid poisoning. The change to hydroquinone cannot occur in the blood, as hydroquinone is a violent poison, whereas *arbutin* has no toxic properties.

THERAPEUTICS

It is used in the same class of cases as buchu, that is to say in chronic inflammatory conditions of the bladder, pyelitis and gonorrhœa.

Prescribing hint.—The quantity of arbutin, in the infusion, is too small to be of much use, and yet if the infusion be made stronger the tannic and gallic acids in it may cause disturbance of the digestive functions. Pure arbutin is therefore to be preferred, and may be given in doses of 4 grains or more, three or four times a day, either in powder or in solution.

VALERIANÆ RHIZOMA. Valerian RhizomeN.O. *Valerianæ*

Habitat.—Great Britain.

Source.—The dried rhizome and rootlets of *Valeriana officinalis*, collected in autumn from plants growing wild or cultivated.

Characters.—A short yellowish-white rhizome, with numerous fibrous roots about two or three inches long; with a bitter camphoraceous taste and a characteristic penetrating odour which is developed by drying.

Identification.—Valerian resembles serpentary, senega, arnica, and green hellebore, but is at once distinguished by its characteristic odour.

Composition.—Its chief constituent is a volatile oil, consisting of valerianic, formic, and acetic acids, united with pinene, a terpene, and borneol. When the plant is kept, *valerianic acid* is set free and gives rise to the characteristic odour. This acid, which exists in many plants and in cod-liver oil, is a derivative of amylic alcohol (*valeryl aldehyd*). It is colourless, oily, strongly acid, with a burning taste and the odour of valerian. *Solubility.*—1 in 33 of water, easily in alcohol and ether.

Action.—Antispasmodic.

OFFICIAL PREPARATION

1. *Tinctura Valerianæ Ammoniata.*—1 in 5. B.P. Dose.— $\frac{1}{2}$ to 1 dr.

ZINCI VALERIANAS. Zinc Valerianate

Syn. B.P.—Zinc Isovalerianate.

Source.—Made by mixing hot solutions of zinc sulphate and sodium isovalerianate. Evaporate, and zinc valerianate will crystallize out.

Characters.—In pearly scales, with a characteristic odour and metallic taste. *Solubility.*—1 in 120 of water.

Incompatibles.—Acids, soluble carbonates, most metallic salts, and vegetable astringents.

B.P. Dose.—1 to 3 grs.

NON-OFFICIAL PREPARATIONS

1. *Ammonii Valerianas, B.P.C.*—In masses of flat colourless *deliquescent* crystals with a strong valerian odour, very soluble in water and alcohol. A 25 p.c. aqueous solution is prepared for dispensing. *Dose.*—2 to 8 grs.

2. **Pil. Ferri Valerianatis Co. B.P.C.** *Syn.*—*Pilula Trium Valerianatum*.—Containing 1 gr. each of the valerianates of quinine, iron, and zinc. Milk sugar and syr. glucose *q.s.* *Dose.*—1 or 2.

3. **Pilula Zinci Valerianatis Co. B.P.C.**—Zinc valerianate 1 gr., compound asafetida pill 1 gr. *Dose.*—1 or 2.

4. **Quininæ Valerianas.**—*See* p. 345.

PHARMACOLOGY AND THERAPEUTICS

Small doses of valerian, like turpentine and the other volatile oils, produce a sensation of warmth in the epigastrium, a quickened pulse, an increase of the cutaneous secretion, and some mental excitement. Large doses slow the pulse, and cause nausea, vertigo, and delirium. There are considerable differences of opinion as to the manner in which valerian produces its effects on the organism. According to *Brunton*, it **paralyses the central nervous system and the cord, reduces blood-pressure, and slows the pulse**; and *Binz* has shown that a previous injection of oil of valerian will **inhibit the convulsions which are caused in animals by brucine and ammonium carbonate**.

Whitla, on the other hand, considers that it acts by **diminishing the irritability of the terminations of the sensory nerves throughout the body**. This theory is supported by the observations of *Martel*, who found that a strong decoction would greatly lessen the pain of wounds, for which purpose it is actually used by the inhabitants of Normandy.

Neligan regards it as a **powerful anthelmintic**, and specially recommends its use **in those cases in which worms excite convulsions**. The ammoniated tincture is useful, as a carminative, in flatulence; and, as a reflex stimulant, in faintness and palpitations, but the essential oil (2 to 5 ms.) suspended in mucilage with cinnamon water is better still. It has also been used with advantage in certain forms of **epilepsy, chorea, laryngismus stridulus and whooping-cough**; whilst large and increasing doses are said to lessen the secretion of urine in **diabetes insipidus**. Ammonium valerianate, in 20 gr. doses, is of value in **neuralgias** of the face and head, and doses of 2 to 5 grs. will often relieve the paroxysms of **migraine**.

The *Pilulæ Trium Valerianatum* are efficient nervine tonics. Valerianate of Quinine is recommended for **nervous headaches, neuralgias** and **hysteria**, especially if intermittent and spasmodic. It is best given in pill form, with glycerin of tragacanth and a little acacia as excipient, and it may with advantage be combined with opium.

The best known salt of them all is the valerianate of zinc, which is credited with possessing both antispasmodic, antihysteretic, and anti-periodic properties. It is of great use in the **flushings of the face, hot and cold sweats, sensation of suffocation in the throat, and nervous palpitations**, to which hysterical patients are subject.

It will also prevent the recurrence of attacks of **hay-fever**.

Note.—Seeing that valerianic acid has not been proved to have any important physiological action, it is advisable whenever it is desired to combine the nerve tonic action of zinc with the antispasmodic effect of valerian to administer oxide of zinc in combination with some preparation of valerian rhizome or else the essential oil, and not to trust to the artificially prepared valerianate.

VALERIANÆ INDICÆ RHIZOMA

Indian Valerian. (*Ind. and Col. Addendum*)

Syn. I. V.—*Jatamansi*, Beng.

Habitat.—India and Eastern Colonies.

Source.—The rhizome and rootlets of *Valeriana Wallichii*.

Characters.—A dull brown, crooked rhizome, about 2 in. long and $\frac{1}{4}$ to $\frac{1}{2}$ in. in diameter, marked with transverse ridges and thickly studded with circular prominent tubercles, to which a few thick rootlets are attached. The crown has a number of bracts; lower end blunt. Smell characteristic.

OFFICIAL PREPARATION

1. **Tinctura Valerianæ Indicæ Ammoniata.**—1 in 5. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.

PHARMACOLOGY AND THERAPEUTICS

The action and uses of Indian valerian are precisely the same as those of ordinary valerian (*see above*).

VERATRINA. Veratrine

N.O. *Liliaceæ*

Habitat.—Mexico.

Source.—Prepared from *cevadilla*, or *sabadilla*, the seeds of *Schœnœaulon officinale*, by adding a concentrated tincture of the seeds to water (which throws down albumen and resins). The watery liquid is then filtered and treated with ammonia, which precipitates the alkaloids.

Note.—Bear in mind that veratrine is *not* prepared from the *Veratrum Viride*, or Green Hellebore, the alkaloids of which are *Jervine* and *Veratroidine*.

Characters.—A pale grey amorphous powder, with no smell but very irritating to the nostrils and exciting sneezing. Taste bitter and acid.

Solubility.—1 in 6 of ether, 1 in 3 of alcohol, readily in dilute acids, almost insoluble in water.

Pure veratrine, $C_{27}H_{51}NO_9$, crystallizes in rhombic prisms.

Composition.—It is a mixture of three alkaloids, *veratrine*, *cevadine*, and *cevadilline*.

Action.—Local anæsthetic.

Dose.— $\frac{1}{16}$ to $\frac{1}{8}$ gr., in pill. (*Rarely given internally.*)

OFFICIAL PREPARATION

1. **Unguentum Veratrinæ.**—1 in 45, white.

NON-OFFICIAL PREPARATIONS

1. **Oleatum Veratrine, B.P.C., U.S.**—Veratrine 2, Oleic acid 50, Olive Oil to 100. Too weak, 10 p.c. preferable.
2. **Collodium Anodynum, B.P.C.** *Syn.*—*Anodyne Colloid.*—Aconitine 1, Veratrine 6, Collodion to 100.

PHARMACOLOGY

Externally.—When rubbed in, it causes **numbness**, followed by a sensation of cold and **anæsthesia** with loss of tactile sensibility, and inability to distinguish between heat and cold. The numbness is often preceded by a burning pricking sensation. When given hypodermically, it causes violent pain and irritation, and sometimes even inflammation.

Internally.—**Gastro-intestinal tract.**—The smallest possible quantity placed in the nostril brings on a violent fit of **sneezing with discharge of bloody mucus**. Similarly, when placed on the tongue, it causes intense **itching of the palate** with burning pain in the mouth and **salivation**. When it reaches the stomach, a sensation of warmth is experienced, which soon becomes of a burning character; later on **violent vomiting, griping, and diarrhoea** appear, and the vomited matter may be mixed with blood. The symptoms also appear when veratrine is given hypodermically.

Blood.—It is absorbed quickly, but is not known to affect the living blood. Outside the body it kills leucocytes.

Heart.—It acts directly upon the cardiac muscle, the **contractions of which become longer and longer**, the rate being diminished to one-half owing to the prolongation of the systole. Finally all parts of the heart become insensitive although it still contracts occasionally. Ultimately it stops in systole. The **functional activity of the vagus is first exalted**, which increases the slowing of the heart. Later on the vagus is depressed, but the direct action of the veratrine on the heart prevents any quickening of the pulse though the beat may become irregular. The blood-pressure at first rises and then falls.

Respiration.—After small doses, respiration is quickened, but large ones retard it, producing long pauses and finally **arresting it altogether**. These results are probably due to primary stimulation and subsequent paralysis of the terminations of the vagi in the lungs, and also to paralysis of the respiratory centre. Temperature is lowered.

Nervous system.—It has no effect upon the brain or spinal cord. The terminations of both **motor and sensory nerves are first excited and then paralysed**.

Muscles.—Here the effect is very peculiar and characteristic. It causes an **enormous prolongation of each contraction**. The latent period and the time of the ascent of the curve is unaltered, but

the height is greatly increased and the descent is extraordinarily extended. A similar form of contraction, which is neither rigor nor tetanus, is met with in **Thomsen's disease**. Brunton has shown that this effect of veratrine is abolished by extremes of either heat or cold, as well as by the local application of potassium salts.

THERAPEUTICS

Externally.—It is chiefly used as an inunction for various **neuralgias**. The best results are obtained in the case of the **fifth nerve**, but it has been found of value in **severe sciatica** and **sick headaches**. Its use is generally followed by some local irritation of the skin. When it comes in contact with the nasal mucous membrane it acts as a **sternutatory** and **errhine**. It will relieve the neuralgic pain that accompanies **herpes zoster**, or **shingles**.

The amyl colloid is an elegant method of obtaining the local action of aconitine and veratrine, which is aided by the evaporation of the amyl hydride. After the collodion has formed a film, the application of a piece of warm moist spongioplene helps the anæsthetic action of the alkaloids.

Doses of $\frac{1}{16}$ gr. twice a day do good in **neuralgia** and **nervous diseases**, and of $\frac{1}{30}$ gr. four times a day have relieved the tremors of **chronic alcoholism** and **disseminated sclerosis**: it is also recommended both internally and externally for **pruritus**, and it has been proved to be an **antipyretic**. On account however of its action upon the heart and collateral effects, it is *very rarely prescribed for internal use*, and must be given with extreme caution and in infinitesimal doses.

VIBURNUM. Black Haw

N.O. *Caprifoliaceæ*

(*Ind. and Col. Addendum*)

Habitat.—India, Eastern and North American Colonies.

Source.—The dried bark of *Viburnum prunifolium*.

Characters.—In thin pieces or narrow quills, glossy purplish-brown, with scattered warts and minute black dots; when collected from old wood, covered with a greyish-brown periderm which is easily removed. Inner surface smooth, pale yellow. Fracture short. Inodorous, somewhat astringent and bitter.

Composition.—Its active principle has not yet been isolated, but it contains (1) *Viburnin*, a glucoside. (2) Valerianic, tannic, gallic, oxalic, citric, and malic acids.

Action.—Astringent, bitter nervine tonic, uterine sedative.

OFFICIAL PREPARATION

1. **Extractum Viburni Prunifolii Liquidum.**—1 in 1 of alcohol (70 p.c.).
B.P. Dose.—1 to 2 drs.

NON-OFFICIAL PREPARATIONS

1. **Malto-Viburnin.**—A combination with extract of malt. Dose.—1 to 4 grs.

2. *Celerina*.—A specialty containing viburnum in combination with celery, coca, and kola. Recommended as a nervine tonic.

3. *Elixir Viburni Prunifolii Co. B.P.C.*—Ext. Viburnum Liq. 50, Ext. Hydrastis 1·75, Ol. Coriander ·50, Ol. Caraway ·50, Glycerin to 100. *Dose*.— $\frac{1}{4}$ to 1 dr.

4. *Ext. Viburni Prunifolii, B.P.C.* *Dose*.—3 to 8 gra.

PHARMACOLOGY AND THERAPEUTICS

Viburnum depresses the motor functions of the cord producing paralysis and abolition of reflexes. It slows the heart, lowers blood-pressure and causes death by cardiac paralysis. Large doses cause headache, amaurosis and dryness of the mouth.

It has been used as a sedative in neurotic and hysterical affections, and as an astringent in sore throat, diarrhoea, and dysentery; but its chief value is in the treatment of obstetric diseases, for which purpose, according to Schatz, it possesses virtues owned by no other drug. It undoubtedly diminishes or checks altogether uterine contractions occurring during pregnancy and endangering its continuance, and it is therefore of use in cases of habitual abortion, when this does not arise from any specific cause such as syphilis or nephritis. Its action is greatly superior to that of morphine or bromide of potassium, but it may often be advantageously combined with the latter at the commencement of the treatment. The best form in which to prescribe it is a teaspoonful of the liquid extract mixed with an equal amount of alcohol twice daily. It must be given for a considerable period. In habitual dysmenorrhoea we must commence the administration of the drug ten or fourteen days before the period is expected. It is also given to check menorrhagia occurring at the menopause, and to relieve the pains preceding and following parturition.

Note.—The dried leaves of an allied species, *Viburnum opulus* (The

.....vely used in America both as an antispasmodic in hysteria, and dysmenorrhoea, and as a uterine sedative in menorrhagia and threatened abortion. It goes by the name of "*Cramp Bark*."

ZINCUM. Zinc. Zn

(Non-official)

Syn. I. V.—*Dastá*, Beng.

ZINCI CHLORIDUM

Zinc Chloride. ZnCl_2

Source.—By dissolving zinc in hydrochloric acid. It is then purified from lead or iron by passing chlorine through it and adding zinc carbonate.

Characters.—Colourless opaque deliquescent rods, or tables, powerfully caustic. *Solubility*.—Freely in alcohol, water, and ether. *Impurities*.—Iron, lead, calcium, and sulphates.

Action.—A powerful caustic (only used externally).

OFFICIAL PREPARATION

1. **Liquor Zinci Chloridi.**—4 ms. equals 3 grs. of solid zinc chloride. Sp. gr. 1.53. *Note.*—On diluting this liquor with water a white precipitate of *basic oxychloride* is formed, which may be redissolved by adding a trace of hydrochloric acid.

NON-OFFICIAL PREPARATIONS

1. **Lotio Zinci Chloridi, B.P.C.**—25 p.c. As eye lotion, and as injection in *gonorrhœa* and *leucorrhœa*.

2. **Causticum Zinci Chloridi** (St. John's Hosp.).—Zinc Chloride 4, solution of Antimony Chloride 2, Starch 1, Glycerin *q.s.*

3. **Collodium Zinci Chloridi.**—1 in 6, forms an imperfect solution.

4. **Guttæ Zinci Chloridi, R.O.H.**—0.5 in 100.

5. **Guttæ Zinci Chloridi cum Cocaina, R.O.H.**—0.5 and 2.0 in 100.

6. **Pasta Zinci Chloridi.**—Zinc Chloride 16 ozs., Pulv. Opii $1\frac{1}{2}$ ozs., Hydrochloric Acid 6 drs., Boiling Water to 1 pint. Macerate the opium in 12 ozs. of the water for 12 hours, add the acid, and filter, dissolve the zinc chloride in the filtered liquid, and add water *q.s.* to produce 1 pint. Then, to 1 oz. of the above solution, add wheaten flour 120 grs., mix, and heat in a water-bath until of a proper consistence.

7. **Darts or Fleches**, spear-shaped, are also made of zinc chloride mixed with an equal weight of either oil of theobroma or gutta-percha. They are intended for insertion into wounds or lancet incisions, and are used in the treatment of malignant tumours which cannot be removed by operation.

PHARMACOLOGY AND THERAPEUTICS

It is a powerful **caustic**, distinguished by its property of **burning deeply** and not spreading sideways like caustic potash and soda. It is also painless. The paste is applied to **cancers, sloughing or unhealthy sores**, and **nævi**; the surrounding skin being first protected by sprinkling it with plaster of Paris. Diluted it is applied to **ulcers**.

It has been used to destroy the **exposed pulp in carious teeth**, **warts, condylomata**, and **lupus**, whilst in recent times it has been employed as an **antiseptic in the treatment of wounds**, which are covered with a mixture of zinc chloride 5 parts, zinc oxide 50 parts, water 50 parts. This causes them to heal without suppuration.

Similarly a solution of zinc chloride 1 part in 11 of distilled water is particularly useful as an antiseptic when applied to the cut surfaces in cases of **excision of the tongue**, **removal of the jaw**, or **operations about the anus and after amputations and excisions in parts affected with putrid sinuses**. Under these circumstances it renders the wound incapable of putrefaction for 2 or 3 days, even though it be exposed to septic influences. Zinc chloride will also render aseptic a wound that has become septic, and an 8 p.c. solution is more energetic than a 5 p.c. solution of carbolic acid. At the same time it is useful in **checking parenchymatous oozing** after operation.

A 1 p.c. solution injected into **ranulæ** and **ganglions** causes the cysts to harden and does not give rise to any pain.

The interstitial injection of a solution of zinc chloride into the tissue surrounding tubercular foci has been recommended by Lannelongue as a remedy for **tuberculosis**: It causes sclerosis and the activity of the bacilli is suspended. A similar treatment has been used, with some success, for **malignant new growths**.

A weak solution of one or two grains in a pint of water is strongly recommended by Ringer, who states that if this solution be injected hourly during the day at the beginning of a **gonorrhœa**, it will cure the disease in 24 to 48 hours.

An impure solution, known as **Sir W. Burnett's Disinfecting Fluid**, is a powerful deodorizing solution, especially useful for disinfecting the utensils in the sick-room of fever patients; it quickly permeates or disintegrates all organic matter with which it comes in contact. The chief objection to its use is that, although it is a violent poison, it is both odourless and colourless, and it is *by the accidental drinking of this fluid that most cases of zinc poisoning occur*. Zinc chloride is **never given internally**.

Toxicology.—The symptoms and treatment of poisoning by zinc chloride are practically the same as already described under the head of the caustic alkalis (*see* p. 617).

ZINCI SULPHAS. Zinc Sulphate



Syn. Commercial.—*White Vitriol*.

Source.—By dissolving zinc in sulphuric acid, and purifying in the same way as the chloride.

Characters.—Colourless transparent prismatic crystals, with a strong metallic styptic taste. *Impurities*—Lead, copper, iron, arsenic.

Identification.—*Closely* resembles magnesium sulphate, but may be distinguished by metallic taste and by the fact that the crystals are not so moist as those of magnesium sulphate and consequently do not stick so closely to the sides of the bottles.

Incompatibles.—Alkalis and their carbonates, lime-water, lead acetate, silver nitrate, vegetable infusions and decoctions, and milk.

Action.—Astringent, tonic, emetic.

B.P. Dose.—1 to 3 grs. (tonic), 10 to 30 grs. (emetic).

OFFICIAL PREPARATION

1. **Unguentum Zinci Oleatis.**—1 in 2. With white vaseline as a basis.

NON-OFFICIAL PREPARATIONS

1. **Collyrium Adstringens Luteum, P. Austr.**—Ammonium chloride 2, zinc sulphate 5, distilled water 890, dissolve and add camphor 2, dissolved in dilute spirit (sp. gr. 0.895) 100. Then add saffron 1. Digest for 24 hours and filter.

2. **Lotio Rubra, B.P.C.**—Zinc sulphate 2 grs., Tinet. Lavand. Co. 15 ms. Water 1 oz.

3. **Injectio Sulphatum, B.P.C.**—Zinc Sulphate, Alum, Ferrous Sulphate, Copper Sulphate each .25, Water to 100. For *gleet*.

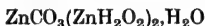
4. **Injectio Zinci Sulph. B.P.C.**—Zinc Sulphate .75 p.c.

5. **Ophthalmic discs** containing $\frac{1}{2}\frac{1}{10}$ gr. zinc sulphate and $\frac{1}{2}\frac{1}{10}$ gr. each zinc sulphate and opium respectively.

6. **Points** of zinc sulphate, or equal parts zinc sulphate and alum or copper sulphate, are moulded for *intra-uterine medication*.

7. **Antiseptin**, said to consist of zinc sulphate 85, boric acid 10, zinc iodide $2\frac{1}{2}$, thymol $2\frac{1}{2}$. Used as a 1 to 2 p.c. solution, 10 p.c. ointment, and as a dusting powder with talc.

ZINCI CARBONAS. Zinc Carbonate



Syn.—Zinc Hydroxycarbonate.

Source.—By boiling together solutions of zinc sulphate and sodium carbonate, and drying the precipitated zinc salts.

Characters.—A white tasteless inodorous powder. **Solubility.**—It is insoluble in water; soluble with effervescence and without residue in dilute nitric acid. **Impurities.**—Sulphates, chlorides, copper.

Dose.—1 to 3 grs. (tonic); 10 to 30 grs. (emetic). Rarely used, except to make the oxide and acetate.

NON-OFFICIAL PREPARATIONS

1. **Calamina Præparata, B.P.C.** **Syn.**—*Prepared Calamine*.—Prepared by calcining native carbonate of zinc and reducing it to an impalpable powder. A pale pinkish brown powder, without grittiness.

2. **Ceratum Calaminæ, B.P.C.** **Syn.**—*Turner's Cerate*.—Calamine and yellow wax of each 15, olive oil 40. A useful application to *burns*.

3. **Linimentum Calaminæ, B.P.C.**—Calamine 20 grs., zinc oxide 15 grs., lime water 2 drs., water 2 drs., olive oil to 1 oz.

4. **Lotio Calaminæ.**—Levigated Calamine 40 grs., zinc oxide 20 grs., glycerin $14\frac{1}{2}$ ms., rose water to 1 oz. Elutriate the calamine and zinc oxide by triturating them in a mortar with successive portions of the water and decanting from the siliceous matter, and add the glycerin. Used in *eczema*, and to conceal *acne spots on the face*.

5. **Unguentum Calaminæ, B.P. '85.**—Calamine 1, Adeps Benzoata 5.

ZINCI OXIDUM. Zinc Oxide. ZnO

Syn.—Chinese White.

Source.—Prepared by the combustion of metallic zinc, or by heating the carbonate to redness in a crucible.

Characters.—A soft, nearly white, tasteless and inodorous powder, becoming pale yellow when heated. Insoluble in water. **Impurities.**—The carbonate and its impurities.

B.P. Dose.—3 to 10 grs.

OFFICIAL PREPARATION

1. **Unguentum Zinci.**—3 in 20. Made with Adeps Benzoata.

NON-OFFICIAL PREPARATIONS

1. **Unguentum Zinci cum Acido Salicylico.**—Salicylic Acid 40 grs., Zinc Ointment and Soft Paraffin of each 1 oz.

2. **Cremor Zinci.**—Zinc oxide 3, white vaseline 17, perfume *q.s.*

3. **Pasta Zinci et Gelatini, B.P.C.** *Syn.*—*Unna's Paste, Gelatinum Zinci.*—Gelatin 15, water 35; soak 22 hours, then heat to dissolve, and add zinc oxide 15, previously rubbed down with glycerin 35. For use it is melted and applied with a brush to *eczematous* surfaces. This *gelatin basis* may be combined with ichthyol or resorcin.

4. **Gelatina Zinci Dura** (St. John's Hosp.).—White gelatin 3, zinc oxide 3, glycerin 5, water 9. Use 1 part less of zinc oxide if to combine with ichthyol or precipitated sulphur.

5. **Pasta Zinci Co. B.P.C.** *Syn.*—*Lassar's Paste.*—Zinc oxide 24, starch 24, salicylic acid 2, vaseline 50.

6. **Pilula Zinci Oxidi et Belladonna, B.P.C.**—Zinc oxide 2 grs., alcoholic extract of belladonna $\frac{1}{2}$ gr. *Dose.*—1 or 2 at bedtime. In *night-sweats of phthisis*.

7. **Pulvis Zinci et Amyli, B.P.C.**—Zinc oxide 1, starch 1.

8. **Pulvis Zinci et Hydrargyri Subchloridi.**—Zinc oxide, calomel, tannic acid, and starch, equal parts.

9. **Plaster Mulls and Salve Mulls** are also prepared, either alone or combined with ichthyol or red mercuric oxide.

ZINCI ACETAS. Zinc Acetate



Source.—By dissolving zinc carbonate in dilute acetic acid, boiling, and allowing the zinc acetate to crystallize out.

Characters.—Thin, translucent, colourless, crystalline plates, of a pearly lustre, and with a sharp unpleasant taste. *Impurities.*—Those of the carbonate.

Incompatibles.—The same as of the sulphate.

B.P. Dose.—1 to 2 grs. (tonic).

PHARMACOLOGY OF ZINC SULPHATE, CARBONATE, OXIDE,
OLEATE, AND ACETATE

Externally.—Their action resembles that of the lead and silver salts, *i.e.* they precipitate the albumen in the discharges and in the tissues and are therefore **astringents** and **mild hæmostatics**. On the whole however they are less powerful, and the astringent action of the carbonate and oxide is very weak.

Internally. Gastro-intestinal tract.—All of them have an astringent action on the mucous membranes, and in large doses, with

the exception of the oxide, they act as **direct emetics**; their action being very prompt and not followed by depression.

Remote effects.—Very little is known on this point, nor do we know how zinc salts act on the blood, in which fluid they undoubtedly remain for a time, probably in the form of albuminates. They are gradually eliminated in the fæces and slightly by the kidneys. After a prolonged course of zinc salts symptoms of chronic poisoning may show themselves, closely resembling those of plumbism. They are said to have a **sedative action on the nervous system**, and to be **remote astringents**: the latter however is doubtful.

In the zinc mines of Silesia the workmen suffer from obstinate catarrh of the respiratory and gastro-intestinal tracts, in consequence of inhaling the dust of zinc oxide, and this is followed by general cachexia, and occasionally by all the symptoms of *tabes dorsalis*. Experiments on animals have shown that another effect of the chronic toxic action of zinc is inflammation and fatty degeneration of the epithelium of the renal tubules.

THERAPEUTICS OF ZINC SULPHATE, CARBONATE, OXIDE, OLEATE, AND ACETATE

Externally.—*Lotio rubra*, or *red wash*, is an excellent stimulating and astringent application to all sorts of **wounds and ulcers**, and is used as an injection in **gonorrhœa, leucorrhœa, ulcers, and otitis**. The ordinary strength is 2 grs. to the ounce, but 3 grs. is a better strength for leucorrhœa, and 1 gr. for otitis. Without the addition of the compound tincture of lavender, zinc lotion (1 or 2 grs. to the ounce) is used as a collyrium in **conjunctivitis**, provided that there be no ulceration of the cornea. Where a less astringent effect is desired, the oleate, oxide or carbonate should be used in any of the various forms described above. Oxide of zinc is particularly useful for all the **skin affections of children** and the *Cremor Zinci* is invaluable for nursery use as a substitute for violet powder. Lassar's paste and the *Unguentum Metallorum* (see p. 444) are good applications for many varieties of **eczema**. Equal parts of zinc oleate, mercuric oleate, and diachylon ointment (p. 566) form an ointment which is a great improvement on the old *unguentum metallorum*, as it is transparent, and the progress of healing can be watched without removing the dressing. All the preparations of calamine are excellent "drying applications" for the treatment of **intertrigo** and **skin diseases**, and Turner's cerate is especially good for **burns**. The *gelatinum zinci* often relieves obstinate **pruritus**, and the points of zinc sulphate can be used as a caustic for **uterine and other ulcers**.

Internally. **Gastro-intestinal tract.**—Sulphate of zinc is an **excellent emetic in cases of poisoning**, and is occasionally used for this purpose in croup and bronchitis, but it is not a safe emetic for very young children. When however an urgent action is required, a dose of 2½ to 3 grs. may be given to a child one year old, and the dose may

be repeated in 15 minutes. To a child of 5 years old as much as 10 grs. may be given followed by copious draughts of water. Small doses of the sulphate or oxide are occasionally given as **astringents** in **diarrhoea**.

Remote effects.—As nervous depressants, both the sulphate and oxide have been given internally in **hysteria**, **epilepsy**, **whooping-cough**, and **chorea**, but it is probable that they are not of any great value in the treatment of these diseases. Oxide of zinc, in combination with belladonna, is occasionally useful for checking the **night-sweats** of **phthisis**.

Zinc salts are reputed to be powerful "**nervine tonics**," whatever that may mean, and Hammond strongly recommends zinc oxide in 2 to 5 gr. doses as a remedy for **nervous headache**.

ZINCI SULPHOCARBOLAS

Zinc Sulphocarbolate



Source.—Obtained by heating a mixture of phenol and sulphuric acid and saturating the product with zinc oxide.

Characters.—Colourless, transparent, efflorescent crystals. *Solubility.*—1 in 2 of water, and 1 in 2.5 of alcohol (90 p.c.).

NON-OFFICIAL PREPARATION

1. **Lotio Zinci Sulphocarbolatis, B.P.C.**—75 p.c.

USES

As an injection in **leucorrhœa** and **gonorrhœa**, in strengths of 2 to 3 grs. to the ounce. Not given internally.

ZINCI VALERIANAS. Zinc Valerianate

See page 672

NON-OFFICIAL SALTS OF ZINC

1. **Zinci Boras.**—A white amorphous powder, used in the form of ointment for **eczema**.
2. **Zinci Bromidum, B.P.C.**—A white, granular, deliquescent powder, with a sharp saline and metallic taste. *Dose.*—2 to 5 grs. in **epilepsy**. Not well borne.
3. **Zinci Citras.**—A basic salt, not perfectly soluble in water. *Dose.*—3 to 12 grs. for **epilepsy**.
4. **Zinci Cyanidum.**—An insoluble white powder, resembling digitalis in its action. Is of value in **heart disease**. *Dose.*— $\frac{1}{10}$ to 1 gr.
5. **Zinci et Potassii Cyanidum.**—A soluble cyanide, possessing all the properties of hydrocyanic acid in a stable form. *Dose.*— $\frac{1}{10}$ to 1 gr.
6. **Zinci Lactas.**—In white crystalline crystals. Has been much used in France as a remedy for **epilepsy**. *Dose.*— $\frac{1}{2}$ to 3 grs.

7. **Zinci Nitras.**—A caustic like the chloride, but penetrates deeper and causes less pain.

8. **Zinci Permanganas.**—As an injection in *gonorrhœa* (see p. 584).

9. **Zinci Sulphis.**—Used as an antiseptic.

10. **Zinci Sulpho-ichthyolas.** (See Sodium Sulpho-ichthyolate).

ZINGIBER. Ginger

N.O. *Scitamineæ*

Habitat.—East and West Indies.

Source.—The scraped and dried rhizome of *Zingiber officinale*.

Characters.—Flattish irregularly branched pieces about 3 to 4 in. long, each branch crowned by a depressed scar. Externally pale buff, striated fibrous. Fracture mealy, short, rather fibrous. Odour well known, agreeable, and aromatic. Taste strong, pungent.

Identification.—Resembles turmeric, but is distinguished both by its taste and smell, and by the fact that it is not yellow.

Composition.—(1) An aromatic volatile oil to which the flavour is due. (2) *Gingerin* or *Gingerol*. (3) Several resins and allied bodies.

Action.—Carminative and antispasmodic.

Dose.—10 to 20 grs.

Enters into.—Infusum Sennæ, Mist. Sennæ Co., Pil. Scillæ Co., Pil. Cambogiæ Co., Pulv. Cinnamomi Co., Pulv. Jalap. Co., Pulv. Opii Co., Pulv. Rhei Co., Pulv. Scammon. Co., Pil. Aloes et Ferri, and the

OFFICIAL PREPARATIONS

1. **Syrupus Zingiberis.**—1 in 40. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.

2. **Tinctura Zingiberis.**—1 in 10. **B.P. Dose.**— $\frac{1}{2}$ to 1 dr.

Enters into.—Pil. Scammon. Co., Acid. Sulphuric. Arom., Infus. Cinchonæ Acid., Solution Sennæ Concentratus.

NON-OFFICIAL PREPARATION

1. **Tinctura Zingiberis Fort., B.P.C.** *Syn.*—*Essence of Ginger, Liquid Extract of Ginger.* **Dose.**—5 to 20 ms.

PHARMACOLOGY AND THERAPEUTICS

Ginger is a powerful **aromatic stimulant**, acting like capsicum and cardamoms (which see). Chewed, it is a valuable **sialagogue**; and used as snuff, it is a powerful **errhine**, but it is chiefly given as a **stomachic**, **carminative**, and **flavouring agent**. Commercial gingerin, which is an oleo-resin, is a useful addition to purgative pills to prevent griping. The dose is $\frac{1}{4}$ to 1 grain.

PART VI

SERUM THERAPEUTICS

The basis of serum therapeutics is the study of the phenomena of immunity. By immunity is meant non-susceptibility to a given disease or a given organism, either under natural conditions or under conditions experimentally produced.

Immunity may be either *natural* (as the immunity of animals against cholera and typhoid fever) or it may be *acquired* either by passing through an attack of the disease or as the result of artificial inoculation, and it is the production of this artificial immunity which is the object of serum therapeutics.

Artificial Immunity.—This may be of two kinds to which the terms *active* and *passive* are usually applied.

Active Immunity is obtained by (a) injections of bacteria in an attenuated condition, or in sub-lethal doses, or (b) by sub-lethal doses of the products of the growth, *i.e.* of bacterial “toxins.”

By repeating these injections, in gradually increasing doses, at suitable intervals, a very high degree of immunity is ultimately produced against the particular organism that has been used for the injections. It is obvious however that such a method of inoculation can only be *preventive*, as it takes a long time to develop. It can never be curative, as the immunity must be developed before the onset of the disease. Once produced however, it affords protection for a considerable time.

Passive Immunity depends upon the fact that if an animal be immunised to a very high degree by the previous method, its serum, when injected into a susceptible animal, will confer immunity upon it provided that it is introduced at the same time as infection occurs or even a short time afterwards. This method therefore can be applied as a *curative* agent, but the passive immunity thus conveyed only lasts for a short period, because in this case there is no active production of “anti-bodies” in the blood.

When the serum of an animal is used in this way for the production of passive immunity in another animal it is found that its effects differ according to the original method of inoculation. If the micro-organisms themselves are used (whether living or dead), the serum is markedly bacteriolytic, but it has little power of neutralizing toxins: it is therefore said to be *antimicrobial*. On the other hand, when filtered toxins are used for the original inoculation, the serum of the immunised animal has the power of neutralizing the toxin and it is said to be *antitoxic*.

(A) ACTIVE IMMUNITY

The following may be mentioned as the most important therapeutical applications of the principles of "active immunity"; i.e. "protective inoculation."

- (1) Jennerian Vaccination against Small-Pox.
- (2) Haffkine's inoculation against Cholera.
- (3) Haffkine's inoculation against Plague.
- (4) Wright and Semple's inoculation against Enteric Fever.
- (5) Pasteur's inoculation against Hydrophobia.

(1) Jennerian Vaccination.

The term "vaccination" was originally applied by Jenner to the process of inoculation with cow-pox (vaccinia) as a protective against small-pox (variola), but it has now been conclusively proved by Copeman that vaccinia is merely variola which has been modified by the method of "passage" through the bodies of a series of cows and we may therefore regard vaccination with the attenuated form of the disease against which we wish to confer immunity. Taking this view it is now customary to apply the term "Vaccination" to all methods of protective inoculation, and the attenuated cultures or toxins which are used for this purpose are spoken of as *vaccines*.

(2) Anti-Cholera Inoculation. (*Haffkine*.)

Haffkine prepares two vaccines of different strength:—

(a) An *attenuated virus*, in which the virulence of the organism is diminished by passing a current of sterile air over the cultures.

(b) An *exalted virus*, in which the virulence has been increased by growth in the peritoneal cavity of a series of guinea pigs.

The dose of each is 1 cc. The patient is first injected with the attenuated virus, and then after a lapse of 3 to 5 days with the exalted one. The disadvantage of these preparations is that they have to be freshly prepared.

Haffkine claims to have obtained great success by this method, but the editor's experiences do not bear out this statement. Indeed it is difficult to understand how the treatment can be expected to be efficacious seeing that in cholera the vibrios are in the intestinal canal, and therefore in a way outside the tissues. They can therefore produce with impunity enormous quantities of toxin against which the bactericidal bodies in the blood have little or no neutralizing power.

(3) Anti-Plague Inoculation. (*Haffkine*.)

This consists of a cultivation of plague bacilli in bouillon, the bacilli having been killed and the solution sterilized by heat. The dose is about 1 c.c. for adults, $\frac{1}{2}$ c.c. for children, $\frac{1}{10}$ c.c. for infant. Two injections, the second 10 or 14 days after the first. The results of

inoculation, as attested by the Indian Plague Commission, have been distinctly satisfactory, for although absolute protection is not afforded, this method of treatment diminishes not only the total number of attacks amongst the inoculated but also the percentage mortality amongst those attacked. The Commission made certain criticisms on the original method of manufacture of this prophylactic, and suggested :—

(a) The employment of a better method of standardization, so as to ensure uniformity of dosage.

(b) The adoption of more efficient methods for the prevention of contamination by other organisms.

Both these recommendations have been carried out and the serum which is now issued from the Bombay Laboratory is much more uniform in its action and is free from the various disadvantages of the original preparation.

(4) **Anti-Typhoid Inoculation.** (*Wright and Semple.*)

This vaccine resembles Haffkine's antiplague prophylactic in that it contains dead Typhoid Bacilli and their toxins. The bacilli are grown in bouillon under strictly aseptic conditions. The initial dose consists of 500 to 1000 million, the second dose of double this quantity.

Two inoculations are made at the interval of ten days. The first inoculation always causes a certain amount of febrile disturbance, with headache and general aching ; in some cases there is also sickness and diarrhoea. The inoculated person should therefore always remain in bed for at least 36 hours. Immediately after the first inoculation there is a fall in the bactericidal power of the patient's blood ; but this is quickly followed by a positive reaction, and it is to allow of the onset of this reaction that the interval between the two inoculations has been fixed at 10 days. Full immunity is not obtained until 4 to 6 weeks have elapsed.

The experiences of the Boer War show that in this method an important prophylactic measure has been discovered. According to Wright's statistics the case-incidence amongst the inoculated was only 2.25 per cent., with a mortality of 12 per cent., against 5.75 per cent. and 21 per cent. respectively amongst the uninoculated.

(5) **Pasteur's Treatment of Hydrophobia.**

Although no bacilli have yet been isolated as the causative agents of this disease there can be little doubt that it is due to a micro-organism with a special affinity for the cellular elements of the central nervous system.

The object of the Pasteur treatment is to secure active immunity against the disease by injecting gradually increasing doses of the Rabies poison into the patient during the long interval that usually intervenes between the bite of the rabid animal and the development

of symptoms of hydrophobia. Unless perfect immunity can be secured during the incubation period, the treatment will fail. It is useless when once the symptoms have developed ; no time therefore should be lost in sending off a patient to a Pasteur Institute.

The Pasteur method is to secure a poison of fixed strength by passing it through a series of rabbits. In this way a virus is secured which is much stronger than that of the dog, and which will kill a rabbit with paralytic rabies in 10 days. This he calls his "*Virus fixe*." The spinal cords of rabbits which have died as the result of inoculation with "*Virus fixe*" are then dried in glass vessels over caustic potash, in dark rooms at a temperature of 60° F., when it is found that the virulence of the cords steadily diminishes in proportion to the time that they have been exposed to this process of desiccation.

Vaccination is commenced with a cord that has been drying for 14 days, a piece of cord 1 centimetre in length being made into an emulsion with sterile salt solution and injected into the flank of the patient. The same evening an injection of a 13 day cord is made ; on the following day there are injections of 12 and 11 day cords, and so on until the patient finally receives an injection from a 1 day cord. No ill effects follow this treatment and there is very little local discomfort or reaction after the injections.

According to the statistics of the Institute Pasteur the mortality amongst those bitten by rabid animals has been reduced by this method of protective vaccination from 10 per cent to 0.48 per cent.

(B) PASSIVE IMMUNITY

Under this head come the various methods by which we endeavour to cure a patient of a given disease by injecting him with the blood serum of an animal which has attained a high degree of active immunity either against the organism which is the cause of the particular disease or against the toxins of the organism, and we have already seen that the sera which we use for this purpose may be divided into 2 groups :—

- (a) Antitoxic Sera, which neutralize toxins.
- (b) Antimicrobial Sera, which kill the bacteria.

(a) Antitoxic Sera :—

The three best examples of antitoxic sera are Diphtheria Antitoxin, Tetanus Antitoxin, and Calmette's Antivenene. Before describing these in detail it is necessary to explain how an antitoxic serum is prepared. The steps in the process are as follows :—

- (1) The preparation of a powerful toxin.
- (2) The estimation of the power of the toxin.
- (3) The development of antitoxin in the blood of a suitable animal.
- (4) The estimation of the antitoxic power of the serum of the animal thus treated.

It is not necessary to go into the details of the manufacture of the toxin. All that need be explained here is that the power of the toxin is estimated by finding out what is the smallest amount that will with certainty cause the death of a guinea pig of 250 grms. within four days. This is called "*minimum lethal dose*" or M.L.D.

A large animal (generally a horse) is then gradually immunised by the injection of increasing doses of this toxin, and when a high degree of immunity has been attained the antitoxic power of the animal's serum is estimated by testing the effect of various quantities against a certain amount of toxin.

That amount of serum which will neutralize 100 times the minimum lethal dose is called an "*immunity unit*," and a "normal" antitoxic serum is one of which 1 c.c. contains one immunity unit.

The following points should be borne in mind with reference to the use of antitoxic sera generally:—(1) In all cases the serum ought to be injected as early in the disease as possible, and in large doses. Even very large doses are without harmful effects beyond the occasional production of urticarial and erythematous eruptions. (2) Where large doses of serum are necessary, injections must be made at different parts of the body; not more than 20 cc. should be injected at one place.

Antidiphtheritic Serum.—The ordinary strength of this serum is such that 10 c.c. contains 2000 units. The dose which was originally recommended was 1500 units; at the present time it is usual to begin with a dose of at least 3000. The Lister Institute states the amount required as an initial dose increases with the lapse of time from onset of disease to the time of injection. If not treated until the second day give 4000 to 8000. If untreated till the third day 8000 to 12,000 units. In all cases when the larynx is involved the initial dose should be at least 6000 and similarly 8000 if nasal symptoms are present. The dose may be repeated in 6 to 24 hours. If there is any objection to using such a large quantity as 20 c.c., then Behring's serum should be selected which contains 3000 units in 5-6 c.c. The serum should always be administered as early as possible: indeed it is of very little use unless it is injected within the first 48 hours of the disease. For this reason in all cases of suspected diphtheria it is well to inject the antitoxin *at once* without waiting for a bacteriological report; even if the case be not one of diphtheria no harm can result from so doing. Another point to remember is that diphtheria is a much more fatal disease in children than in adults, and that children therefore require if anything larger doses of antitoxin than adults. Do not make the mistake of reducing the dose of antitoxin in proportion to the age of the patient.

The proper place for injection is in the flank or between the shoulder

Antitetanic Serum.—In estimating the strength of this serum a different unit is used to that already described. This is called the

"Roux unit" and represents the amount that will protect 1 grm. of body-weight of a given animal from the minimum lethal dose. The strength of a good antitoxic serum should be such that 1 c.c. contains at least 1,000,000 such units, i.e. 1 c.c. should protect 1,000,000 grms. of guinea pig against the minimum lethal dose. If antitetanic serum is to be of any use it must be administered without a moment's delay where there is any suspicion of tetanus and not less than 100 c.c. of such a serum should be injected within 24 hours in 5 doses of 20 c.c., each at a different part of the body, and this followed up by further injections if no improvement takes place. It is stated that better results have been obtained by intravenous injection and that large amounts can be safely used in this way. The serum has also been introduced intracerebrally and subdurally and cases of recovery are reported. Although this serum has not given very good results when used after the symptoms of tetanus have developed, there can be no doubt of its value as a prophylactic. Tetanus has an incubation period of about a month and many a life may be saved by the use of this serum in all cases of contused and lacerated wounds, especially in a city like Calcutta where tetanus is such a scourge. The prophylactic use of this serum is now a routine treatment in the Calcutta Medical College Hospital. In this connection note the treatment of all dirty wounds by swabbing them with fresh Tinct. Iod. after drying, and avoidance of all cleaning by washing or scrubbing.

Antivenene.—Calmette's original preparation consists of the serum of a horse which has been immunised against the poison of the cobra. According to him the venom of all snakes is of a similar nature, and he recommends this preparation as an antidote for the bites of either the colubrine or viperine varieties. Each cubic centimetre of this serum contains 20,000 Roux units of immunity, and the ordinary dose is stated to be 10 c.c. The serum however ought to be perfectly fresh and the injection requires to be made at once or within an hour of the bite.

There has been considerable controversy both as regards the universal applicability of this serum in all kinds of snake-bite and as regards the dosage.

Lamb estimates the necessary dose at 40 c.c. on the assumption that a cobra ejects 30 to 45 milligrammes of poison, but Rogers, who agrees with the original observations of Cunningham, finds that the average amount of poison ejected by a healthy cobra is 254 milligrammes.

If this estimate be correct, then the proper dose of the serum must be 400 c.c. Moreover if it is to be of any use it must be injected intravenously, as when administered subcutaneously it is absorbed more slowly than the snake poison.

It appears also that there is a difference in the action of the poison of the Colubrine and Viperine snakes, and that an antivenene pre-

pared by immunization against the poison of the former will not act as an antidote in the case of a bite by one of the latter. For this reason the antivenene which is now sent out from the Pasteur Institute at Kasauli is a mixture of Anticolubrine and Antiviperine sera. It is made by immunizing two horses separately and then mixing the sera. The object of this is to give the patient the best chance of recovery in the event of there being any uncertainty as to the particular class of snake by which he has been bitten. Now if Rogers' estimate is correct, it follows that 800 c.c. of this serum must be injected intravenously to ensure success in a case of cobra-bite. This almost places antivenene outside the range of practical therapeutics.

Moreover Lamb has shown that antiviperine serum made by using the venom of Daboia (Russell's Viper) has no antidual effect against the venom of other vipers, so that antiviperine serum, to be effective, must be made by using the venom of the particular viper by which the patient has been bitten.

For this reason one cannot regard either Calmette's colubrine antivenene or the polyvalent serum of Kasauli as a specific against snake-bite. Possibly the chief value of either preparation is to neutralize any poison that may have been absorbed into the system before steps can be taken to check absorption by means of the elastic ligature and to destroy the poison at the site by the application of potassium permanganate according to the method devised by Sir Lauder Brunton. Antivenene therefore can only be considered to be a valuable adjuvant to the local treatment of the bite.

(b) Antimicrobial Sera :—

In the preparation of these sera the immunization has been carried out by the injection of the living or dead bacteria which are the cause of the disease against which it is wished to secure protection. They are therefore not merely antitoxic; they are actively bactericidal. In addition to this there is one very important difference between antitoxic and antimicrobial sera.

This difference is that whereas in antitoxic sera the actual substance which neutralizes the toxin is of the nature of a chemical antidote, the bactericidal effects of the antimicrobial sera require the presence of two distinct substances, which are called the "*immune body*" and the "*complement*." The immune body is only developed in the serum after the injection of bacteria, but once developed it is fairly stable. The complement on the other hand is present in normal serum in small quantity, but it is easily destroyed by heat and it rapidly disappears from the serum after withdrawal from the body. The complement appears to be the nature of a ferment and it is probable that it is the actual bactericidal agent, whilst the immune body is merely the connecting link between it and the bacterium upon which it acts.

Be that as it may, there can be no doubt of the following facts :—

1. In order that an antimicrobial serum may be of any use the presence of both "immune body" and "complement" is necessary.

2. "Complement" rapidly disappears from the serum after it has been withdrawn from the body.

3. The "complement" which exists naturally in human blood serum does not appear to act in conjunction with the "immune body" contained in the serum of the horse.

The practical result of all this is that antimicrobial sera must always be fresh. Old serum is absolutely useless.

Antistreptococcic Serum.—This is an antimicrobial serum prepared by injecting cultures of streptococci into a horse. It is used chiefly in the treatment of **septicæmia**, **puerperal fever**, **erysipelas**, and **infective endocarditis**, but the results have not been very satisfactory on the whole.

This failure to obtain good results has been attributed to three causes :—

1. The "complement" rapidly disappears from the serum, which is therefore of little value unless it is perfectly fresh.

2. There is reason to believe that under the generic name of *Streptococcus pyogenes* are included several different "strains" of bacilli, which although they resemble one another in appearance show marked differences in their chemical reactions. For this reason it is usual nowadays to immunize the horse with as many different strains of streptococcus as possible and so to produce what is known as "Polyvalent" serum.

3. Infective endocarditis may be due to the invasion of other organisms, such as the pneumococcus or staphylococcus. In this case an antistreptococcic serum is not likely to be of any use.

If therefore success is to follow treatment by antistreptococcic serum, the following rules must be observed :—

1. Always make a preliminary blood culture to satisfy yourself that the infecting agent is really a streptococcus.

2. Always use a "polyvalent" serum.

3. See that the serum is fresh; otherwise the "complement" will have disappeared. Serum that is more than six months old is absolutely useless.

4. The serum must be administered by hypodermic injection; it is useless to give it by the mouth or rectum.

5. Large doses are necessary; not less than 30 c.c. per diem, and it must be continued for some time.

6. If no benefit be evident within 4 days, try another brand of serum, as the one you are using may not contain the particular "strain" you require.

7. In all cases better results are obtained by vaccine prepared from

cultivation of micro-organisms obtained from the patient's blood, discharge, urine, &c., than from stock vaccines.

8. It should be remembered that treatment by vaccine is not intended to replace but only to supplement other treatment.

In addition to the ordinary "polyvalent" serum, Messrs. Burroughs and Wellcome prepare the following:—

1. *Antistreptococcus Serum, Erysipelas*.—Prepared by immunization of horses with culture obtained from typical cases of erysipelas.

2. *Antistreptococcus Serum, Puerperal Fever*.—Prepared in a similar manner with cultures from 26 severe cases (some fatal) of puerperal fever.

3. *Antistreptococcus Serum, Scarlet Fever*.—Prepared by using cultures of streptococci obtained from cases of scarlet fever.

4. *Antistreptococcus Serum, Rheumatic Fever*.—Prepared by using cultures obtained from severe cases of acute rheumatism and rheumatoid arthritis.

5. *Antistreptococcus Serum Pyogenes*.—Prepared by using cultures from various strains of *Streptococcus pyogenes*.

Only two of the above require any special mention, namely the rheumatic and the scarlet fever varieties.

As regards the former, Menzer, who holds that rheumatic fever is a streptococcic infection arising from absorption in the upper air-passages, has for several years treated this disease by injections of a polyvalent serum, and he claims that though this is slower than the salicylate method, the final results are much more satisfactory especially as regards endocarditis and the liability to relapses. The first effect of the serum is to cause increase of the local manifestations and of the effusions into the joints. It is therefore absolutely contra-indicated if there be already any stenosis of the mitral valve, or pericardial or pleural effusions.

The ordinary dose of the serum in acute cases is 5 c.c. and the injection should be made in the vicinity of the joint chiefly affected.

In chronic cases a dose of 5 c.c. is injected every second or third day until 30 c.c. have been given, when a pause of one or more weeks is made, and then the injections are recommenced. In a considerable number of cases there is marked local reaction after the injection, as shown by oedema and redness of the skin, and not infrequently great prostration follows the use of the serum. The general consensus of opinion is therefore that it should only be used in subacute and chronic cases, and that it should only be resorted to in acute cases after the failure of the ordinary methods of treatment.

The treatment of scarlet fever by antistreptococcus serum was introduced by Moser of Vienna, who claims that all children treated by him within 3 days of infection recovered. The minimum dose injected at one time is 100 c.c. and the maximum 200 c.c. It may be necessary to give a second injection within 24 hours, but if these

two doses have no effect on the temperature, continuation of the serum is not likely to be of any value. As in diphtheria it is essential that the serum should be given early: the longer the disease has lasted, the less likelihood is there of beneficial effect.

Palmuski and Zebranski have recently prepared a specific anti-scarlatinal serum by using the *Streptococcus conglomeratus*, which they agree with Klein in believing to be the specific microbe of this disease. Their serum has been tried in over 1000 cases, in all of which the beneficial effect was marked, and it seemed to exert a very favourable influence on **scarlatinal nephritis**, which was much less common in cases treated by this method.

N.B.—On account of the property possessed by this sera of causing bacteriolysis they are sometimes called "Streptolytic."

Antipneumococcic Serum.—This is a similar serum prepared by immunization of a horse with various strains of *pneumococcus*. It should always be polyvalent, and the same general rules apply as given under the head of antistreptococcic serum. It has been used in **pneumonia** and in the pneumococcal varieties of **infective endocarditis** and **meningitis**, but the results have not been very satisfactory as every patient appears to breed his own special strains of germs.

Antistaphylococcic Serum.—This is a polyvalent serum prepared by immunization with various strains of *Staphylococcus aureus*, *albus*, *citreus* and *haemorrhagicus*.

It may be used in all forms of **pyæmic infection**, but specially in those cases of **infective endocarditis** in which blood culture shows that the infective organism is a staphylococcus.

An **Antigonococcic Serum** has been prepared and although it does not appear to greatly affect the acute disease, most encouraging reports have been received as to the benefits noted in following its use in **chronic gonorrhœal arthritis**. It is said to be effective when injected per rectum.

Antimeningococcic Serum (Flexner) has recently been prepared and good results reported as following its intra-spinal injection in cases of **cerebro-spinal fever**, the mortality having been reduced so it is said from 80 to 42 p.c.

Slavo's Serum for Anthrax.—This is antimicrobial serum prepared by immunization of a horse against *Bacillus anthracis*. Excellent results have been reported from its use.

The dose of the serum recommended in ordinary cases is 30 to 40 c.c. subdivided into three or four injections subcutaneously into different parts of the abdomen, and followed in 24 hours, if necessary, by further injections of from 20 to 30 c.c. In grave cases the injection should be intravenous, preferably into one of the superficial veins on the back of the hand. The dose in this case should be 10 c.c. followed in an hour or two, where there is no improvement, by another similar dose.

In an ordinary case of malignant pustule, such as is seen in those dealing with hides, if seen at an early stage, a single injection may be sufficient to effect a complete cure with very little loss of substance.

Shiga's Antidysenteric Serum.—This is a polyvalent serum prepared by immunizing a horse against various strains of *B. dysentericus*. It is claimed by Shiga that by its use he has reduced the mortality from bacillary dysentery in Japan from 35 per cent. to 9 per cent., but the experience of other observers does not support this statement. It is important always to use polyvalent serum as it is now certain that there are a very large number of strains of this bacillus, and it appears that a serum made from a bacillus of an "acid type" is not curative for disease caused by an "alkaline type" bacillus, and *vice versa*. The dose is 20 c.c. If it is to be of any use, it must be used very early in the case, preferably in the first nine days of the illness.

Yersin's Anti plague Serum.—This is a curative antimicrobial serum, prepared by immunization of a horse against *B. pestis* in the usual manner. It must not be confounded with Haffkine's prophylactic vaccine. It requires to be used in very large doses, not less than 50 c.c., and it is recommended that in acute cases it should be administered intravenously. This method of treatment was reported to be very successful in China, but it proved a failure in Bombay, and the writer after an extended trial of it in Calcutta has not been able to convince himself that it in any way improves the patient's chances of recovery. All that it appears to do is to reduce the initial tendency to hyperpyrexia.

Pollantin.—This is a hay fever specific, prepared by Dunbar by immunizing horses with irritant toxins obtained from the pollen of grasses. The serum is obtainable in two forms, a fluid preserved with .25 per cent. carbolic acid, and a dried powder diluted with sugar of milk. The name "Pollantin" is properly only applied to the fluid serum. This preserves its power for many months provided that it is not exposed to the action of the air, but it is readily contaminated by growths and should therefore never be used for more than a week after the bottle has been opened. The method of administration is to instil a drop or two into the outer margin of the eye whilst the lower lid is pulled down with the finger. It then quickly checks the suffusion of the eyes, the sneezing and the general discomfort. For the nose the best form is the powder, which may be used as a snuff. Sometimes relief is obtained by the powder, even when the fluid fails to act. Pollantin is best used as a prophylactic or else very early in the attack; during a severe attack the serum has very little chance as it is quickly swept away by the tears. It should be applied both to the eyes and nose every morning before rising, and should any irritation come on during the day, the application may be repeated. The subcutaneous use of the serum is not advisable, as it is apt to cause local irritation and erythematous or urticarial

rashes. The local use of the serum causes no ill-effects and does not lead to the formation of a habit.

It does not appear to have produced the curative or prophylactic results at first claimed for it. An attempt has been made to explain this alleged failure by stating that many on whom the treatment has been tried were not suffering from genuine hay fever but from asthma or other troubles.

Three other preparations remain for consideration.

They are :—

1. Koch's Tuberculin T.R.
2. Coley's Fluid for Sarcoma.
3. Wright's Staphylococcic Vaccine.

These have been kept to the last because their action is not quite so simple as that of either the ordinary protective "vaccines" or the curative "anti-sera."

Their effects depend upon one or the other of the following factors :—

- (a) Increase of "opsonic effect" in the blood serum of the patient.
- (b) Variations in the virulence of micro-organisms as the result of symbiosis.

Each of these requires a few words of explanation.

(a) *Increase of "opsonic effect."*

By this is meant a marked increase in the phagocytic power of the white blood-corpuscles due to the development in the blood-serum of a peculiar substance which modifies the bacteria in such a way as to render them an easy prey to the leucocytes.

Wright calls this "opsonic effect" and he uses the term "opsonins" to indicate the elements in the blood fluids which produce this effect; he also points out that this is something quite different from the ordinary agglutinating and bacteriolytic action of the serum, and that, whereas in healthy persons there is very little variation in the opsonic power of the blood-serum, in diseased conditions the activity of the serum may be either greater or less than normal, this variation being specially marked in cases where there is an actual septicæmia or bacterial invasion of the blood. He therefore concludes that in health there are opsonins present in the blood and that under the stimulation of bacterial invasion, the opsonins are at first diminished ("negative phase") and then increased ("positive phase").

In order to ascertain through which of these phases the patient is passing it is necessary to estimate the "opsonic index" of his blood. This is done by ascertaining the average number of bacteria taken up by each polynuclear leucocyte of the patient's blood and comparing this with the average number taken up by each leucocyte of the blood of a healthy individual. Thus if there be an average of 3 bacilli in each leucocyte of the blood under examination and 5 in each leucocyte of normal blood, then the "opsonic index" is

$\frac{1}{5}$ or $\cdot 6$, which shows that the patient is passing through the negative phase.

Tuberculin T. R.—Koch's original tuberculin which was introduced for the cure of phthisis proved a failure and its use had almost been abandoned except in the treatment of **lupus** and **surgical tuberculous diseases**. This method of treatment has however received a new lease of life in consequence of the production of improved Tuberculin T.R. and of the application of Wright's method of estimation of the opsonic index to the determination of suitable cases and suitable dosage.

Tuberculin T.R. is an emulsion of dead tubercle bacilli. It is an opalescent liquid containing 10 milligrammes of solid substance in each c.c. It may be diluted with a 20 per cent. solution of glycerin.

It is found that injection of small doses of Tuberculin T. R. causes first a temporary fall in the opsonic index lasting from a few hours to as much as 14 days, and that this fall is followed by a prolonged rise. This action is presumably exactly the same as that caused by the absorption of the products of bacterial activity in the course of phthisis, the characteristic feature of which is that in the early stages you find periods of activity alternating with periods of quiescence, these alternations being associated with corresponding variations in the opsonic index, but that later on when the disease becomes chronic the opsonic index remains steadily increased or decreased according to the presence or absence of a response by the tissues to the stimulus caused by the bacterial toxins.

As regards the practical application of the estimation of the opsonic index to the method of treatment of phthisis by Tuberculin T. R., the following may be taken as representing the present trend of opinion of those who have tested its value :—

1. Tuberculin should be employed in *small doses*, beginning with $\frac{1}{100}$ mgrm. and not exceeding $\frac{1}{50}$ mgrm. Large doses tend to produce a marked negative phase with a less marked positive phase in the opsonic index, whilst small doses give a slight negative and a marked positive phase.
2. Tuberculin *should not be used in acute cases or in the active stage of the disease*; otherwise the negative phase due to the tuberculin may intensify that which has already been produced by the living bacteria and may cause a serious lowering of the patient's power of resistance.
3. The dose *should not be repeated till the positive phase is well established*, as a second dose during the negative phase lowers the power of resistance of the body.
4. The *most suitable cases are those in which the disease is chronic and in which the opsonic index is found to be low*; but if the use of the serum is found to produce no marked increase in the opsonic index, which shows the tissues have lost the power of response, the treatment should not be persevered with.

5. Excellent results have been obtained in **lupus** and in **surgical tubercular affections**, especially of the joints and glands.

6. *The treatment should, as a rule, only be carried out when it is possible to test the opsonic index frequently*, but it is possible that in chronic cases the treatment may be safely carried out without this precaution, provided that only a small dose is used and that the dose is not repeated within a fortnight. It should not be injected every second day, as is recommended in the directions issued by Koch.

7. *The opsonic index must always be determined after a period of rest*; otherwise the results may be misleading.

From the above it is obvious that the tuberculin treatment is not capable of universal application and it is probable that its use will be confined to Sanatoria and similar institutions where there is a proper bacteriological equipment: even then it must be considered as only an adjunct to other lines of treatment.

Moreover there is always the possibility that the production of the negative phase may be attended by a slight risk of lowering the tissue resistance in latent cases to such an extent as to cause a lighting up of the disease and possible extension of infection to other organs. The risk however is practically negligible if the precautions noted above are observed.

Owing to the difficulty of determining the opsonic index on account of the complicated technique, the different results arrived at by different skilled observers, and the frequent variation of the index from day to day when so obtained, there has been an increasing tendency of late to dispense with opsonic index estimation in private practice and to rely on clinical symptoms as a guide to dosage and frequency of inoculation. In chronic cases, glands, joints, genito-urinary tuberculosis, &c., the use of small doses, especially if the progression be gradual, from low doses 0.00001 c.c. to higher doses (up to 0.001 c.c.), no ill effect can result and much good may be brought about. As noted above the frequency of administration, 8 to 12 days, is controlled by the clinical symptoms, pulse rate, temperature, &c.

(b) *Variations in Virulence.*

It is a well-established fact that the virulence of a given micro-organism may be either exalted or attenuated by the method of symbiosis, i.e. by growing it in conjunction with another micro-organism. Also that the growth of one micro-organism may completely inhibit the growth of another. This is the principle underlying Coley's method of treatment for inoperable sarcoma.

Coley's Fluid.—Coley having observed that a malignant sarcoma of the neck entirely disappeared after several attacks of erysipelas, endeavoured in the first instance to cure sarcomas by injecting patients with living cultures of the Erysipelas *Streptococcus*, but he quickly

found that this method has two great drawbacks, firstly that it is very difficult to produce erysipelas at will, and secondly that once produced it is very difficult to control it. He also discovered that the curative effects of erysipelas were largely due to the toxic principles of the streptococcus which might be utilized without the production of erysipelas. His next step was the discovery of the fact that the action of the streptococcus of erysipelas can be greatly intensified by using the combined toxins of *Bacillus prodigiosus* and the Streptococcus. Coley's fluid, as now used, is prepared by cultivating the streptococcus from a fatal case of erysipelas in bouillon for three weeks in the incubator. The bouillon is then sown with *Bacillus prodigiosus* and allowed to grow at room temperature in the daylight for 10 days more. The culture is then killed by heating it to 60° C. in a water-bath for one hour, and a few c.c. of glycerin and a little thymol are added as a preservative.

The following are the rules for its administration :—

1. It may be used in all varieties of **sarcoma** : its action is most marked in spindle-celled and least of all in melanotic sarcomata.
2. It may be used for three distinct purposes (a) where the tumour cannot be removed, (b) to prevent recurrence of the tumour after operation, (c) to render amputation unnecessary.
3. Always begin with the minimum dose, for the reason that individual susceptibility varies greatly.
4. For local injections the dose should be much smaller than for interstitial injection remote from the tumour. The initial dose for injections into the tumour should be $\frac{1}{4}$ to $\frac{1}{2}$ minim ; for injections remote from the tumour 1 minim.
5. The dose should be gradually increased until you obtain a chill and febrile reaction.
6. If the injections cause depression following the reaction, the injections should only be given every other day, but daily injections increase the chances of success.
7. If the tumour becomes soft and fluctuating, open the softened areas, establish drainage and treat by ordinary aseptic principles.
8. A good tonic should be given during treatment and great attention paid to keeping the bowels free.
9. In successful cases a marked improvement is usually noted in from one to four weeks. If no improvement has occurred within this period, the treatment should be discontinued. If however there is decided improvement, the injections should be continued until the tumour has totally or nearly disappeared. In some of Coley's cases the treatment was continued for more than a year, but the average duration is about two or three months.
10. Use an ordinary hypodermic syringe, and when injecting doses of less than 1 minim, dilute the toxin with water that has been sterilized by boiling.
11. When using Coley's fluid as a prophylactic smaller doses may

be given and it is not advisable to push them to the point of producing a chill.

There can be no doubt that this treatment affords the only hope of life in cases of **inoperable sarcoma** and it should therefore always be given a trial.

Wright's Staphylococcic Vaccine.—This is prepared by growing staphylococci upon agar and then making an emulsion with sterilized salt solution and finally killing the microbe by heating the emulsion to 60° C. in the usual manner. The growth should be standardized by estimating the number of cocci; and one dose, which is usually $\frac{1}{2}$ to 1 c.c., should contain from 1000 to 2500 millions of staphylococci.

This vaccine has proved useful in various *chronic* forms of staphylococcal infection, such as **acne**, **furunculosis** and **sycosis**, and this is especially the case where the cultures have been made from the particular strain of micro-organism which has acclimatized itself to grow in the patient's body.

The injections of the vaccine, as in the case of tuberculin, are followed by a negative phase, during which the resisting power of the patient is lowered. Then comes the positive phase with a marked rise in the opsonic index, and lastly a comparatively durable period of increased resistance.

There is very slight constitutional disturbance, and after the negative phase has passed off, the initial dose of $\frac{1}{2}$ to 1 c.c. may safely be doubled.

Rogers, acting upon the well-known clinical fact that cases of cachexial fever frequently improve after a staphylococcal infection, has prepared a special staphylococcal vaccine from a strain of staphylococcus isolated from a case of *canerum oris*, and is using this in the treatment of cases where the Leishman-Donovan body has been found.

His initial dose is 2 c.c. so as to get a definite temperature reaction and local swelling for two days. He states that as the result of this treatment there is first of all a marked increase of the leucocytes and that this is followed by diminution of the fever and often by a decrease in the size of the spleen.

PART VII

ORGANO-THERAPY

Just as the study of the phenomena of immunity forms the basis of Serum Therapeutics, so a knowledge of the theory of internal secretion is essential for the proper application of the principles of Organo-Therapy.

Experimental physiology and clinical and therapeutical observations have demonstrated that the so-called "ductless glands," viz. the thyroid, the pituitary body and the adrenals, produce from material brought by the blood substances that are essential to health and life. These substances are passed into the lymphatics and blood-vessels and are therefore called "*internal secretions*" to distinguish them from the ordinary external secretions which are poured out in epithelial surfaces communicating directly or indirectly with the outside of the body.

There is also evidence to show that certain of the glands with ordinary external secretions also elaborate an internal secretion. They are the pancreas, the kidney, the testicle, the ovary and possibly the liver.

It is now beyond doubt that premature atrophy or the onset of morbid changes in the above-mentioned glands may cause serious diseases by interference with the function of internal secretion, and this interference may manifest itself in one or more of three ways:—

- (a) By diminution of secretion
- (b) By excessive secretion.
- (c) By abnormality of secretion.

The object of organo-therapy therefore is twofold, viz. :—Either to supply an internal secretion that is wanting, or else to neutralize a secretion which is in excess or contains abnormal constituents.

Within the last few years an enormous number of animal extracts have been placed upon the market, but the majority of these are still upon their trial. Those which have established a firm reputation in the field of therapeutics are the extracts of the thyroid gland and the adrenals; to which may be added bone marrow and the acid extract of duodenal mucous membrane. With reference to the numerous preparations of other organs the student is advised to withhold his judgment pending further developments and not to imagine that twentieth century therapeutics consist in prescribing dried fragments of various internal organs for all the ills the flesh is heir to. There is nothing new in organo-therapy: it has existed from time immemorial, and the physician who blindly prescribes organic

extracts without having a clear idea of what he is aiming at is reverting to mediæval methods as exemplified by the "eye of newt and toe of frog" and all the other appetizing constituents of the celebrated "hell-broth" of the witches in Macbeth.

The Thyroid Gland.

There are two classes of disease associated with abnormality of the thyroid gland:—

1. Those in which there is an absence of internal secretion.

2. Those in which the internal secretion is either abnormal or excessive.

1. Under this head are included **myxœdema** and **cretinism**, **arterio-sclerosis**, **obesity** and some forms of **premature senility**. The treatment of these by means of thyroid extract has been fully dealt with in Part V. (see page 657) and no further remarks are necessary.

2. Under this head is **exophthalmic goitre**, or **Graves' disease**. Numerous methods have been devised with the object of neutralizing the excessive and abnormal secretion, to which the unpleasant symptoms of the disease are believed to be due.

The chief of these are the following:—

1. The use of **Thymus Extract**.

2. " the milk of thyroidectomized goats.

3. " the serum of thyroidectomized sheep.

4. " thyrolytic serum.

1. Thymus Extract.

The rationale of this treatment is that there is frequently persistent enlargement of the thymus gland in **exophthalmic goitre**, which enlargement is believed to be conservative. The results appear to vary: some observers report that there is no obvious effect; others affirm that benefit is derived, especially by lessening the tachycardia.

The treatment does not cause pyrexia or any form of constitutional disturbance. The dose of the desiccated gland is 3 to 10 grs. It may be obtained either in the form of a powder or of tablets (3 and 5 grs.). Other preparations are:—

Liquid Extract of Thymus Gland.—(1 = 1). *Dose.*— $\frac{1}{2}$ to 2 drs.

Acidum Thymicum. *Syn.*—*Solurol*. *Dose.*—5 to 10 grs.

Thyminic Acid tablets, 4 grs. in each.

Thymus extract is also recommended in **ricketts**, **hæmophilia**, **chlorosis**, and **anæmia**.

2. The Milk of Thyroidectomized Goats.

The theory of this remedy is that when the goat has been deprived of its thyroid its milk will contain an excess of the toxin which is normally destroyed by the thyroid, and hence will tend to neutralize excessive thyroid activity. This method of treatment has obvious

disadvantages and it is now usually given up in favour of the next method, which depends upon similar principles and is easier to carry out.

Rodagen.—Is a white powder consisting of the dried milk of these thyroidectomized goats.

Dose.—75 to 150 grs. daily.

3. The Serum of Thyroidectomized Sheep.

This is obtainable in two forms:—

1. Möbius's Serum, or Antithyroidin.
2. Thyroidectin.

(1) *Möbius's Serum.*—This is blood serum obtained from rams six weeks after extirpation of the thyroid, to which 0.5 p.c. phenol has been added as a preservative. It is said to keep indefinitely and is therefore more generally useful than the milk, besides which it probably contains a larger proportion of toxins. It may be given subcutaneously in doses of 15 ms. at first every day, later every alternate day, but is usually given by the mouth in doses of 8 to 75 ms. (0.5 to 5 c.c.), and it is best administered in wine, syrup or milk. The best method of administration is to put the patient upon a course of 40 to 50 grams in doses of 1 c.c. four times a day and then stop it and await developments. As a rule improvement is rapid, the patient becomes quiet, sleeps better and puts on weight, whilst both the exophthalmos and the swelling subside. The amount of serum to be used varies in different cases: one of those reported by Alexander relapsed after two months, but he reacted well to a second course of 50 grams. The amount of serum given cannot be increased indefinitely; otherwise there is danger of producing symptoms of athyroidism, namely a mild type of myxœdema with headache, apathy and mental stupidity. Dürig reports a case where this happened after the administration of 230 c.c.

(2) *Thyroidectin.*—This is a brown powder prepared by inspissating the serum of thyroidectomized animals. It is sold by Messrs. Parke Davis & Co., and its use is similar to that of Möbius's serum. *Dose.*—5 grs. in capsule.

4. Thyrolytic Serum.

Beebe has prepared an antithyroid serum, which not only contains a specific cytotoxin, but also has the power of neutralizing the thyroid secretion. He accomplished this by isolating the nucleo-proteids and the thyroglobulin of two glands removed from patients with exophthalmic goitre and injecting these into rabbits. This serum, being made from human organs, is capable of doing great harm to man and must therefore be used very cautiously and in small doses only, not more than 1 c.c. for each injection. Rogers reports on ten cases treated by this serum. The results were as follows—three were apparently perfectly cured, three were arrested from a critical

condition and are approaching a cure, whilst the remainder all show more or less signs of improvement. These results are very striking, but the difficulty of obtaining material for Beebe's serum must at present stand in the way of its commercial use.

The Suprarenal Glands.

The active principle of the suprarenal bodies is a greyish crystalline substance, called **Adrenalin**, which is contained in the medullary portion of the glands. It is very insoluble and therefore the preparation generally used is a solution of Adrenalin Chloride.

Different manufacturers have given various names to this substance, such as Hemisine, Renaglandin, Adnephryn, Suprarenalin and Renostypicin.

Method of preparation.—The suprarenal glands are reduced to pulp and macerated, excluding oxygen as much as possible, in warm water or very dilute acid for 5 hours, and the mixture is then heated to 90° C. to coagulate albuminoids. The watery extractive is then evaporated and extracted with alcohol, and the adrenalin is then precipitated by means of ammonia.

Various preparations of suprarenal substance are on the market (such as tablets of fresh gland substance, dry extract, &c.) but nowadays they are practically abandoned in favour of the solution of adrenalin chloride.

Adrenalin Chloride Solution.—This is a solution of 1 of adrenalin chloride in 1000 of normal saline solution, to which 0.5 p.c. of chloretone has been added.

Dose.—5 to 30 ms. by the mouth. When used as a hypodermic injection it should be diluted 10 times with normal solution. This solution is easily oxidizable and it turns pink on exposure to air and light: the bottle should therefore be opened as little as possible.

PHYSIOLOGICAL ACTION OF ADRENALIN

It cannot be considered a ferment as it is thermostabile.

The intravenous injection of a very small dose causes a transient but enormous rise of blood-pressure and also marked dilatation of the pupils. If the vagus is intact this rise in blood-pressure is accompanied by marked slowing of the heart's action, which disappears on cutting the vagi and must therefore be due to stimulation of the cardio-inhibitory centre in the medulla. When this inhibition is removed there is both quickening and strengthening of the heart's beat, which must be due to direct action upon the heart itself as it persists after section of the cervical cord. Plethysmographic observations show that the rise in blood-pressure is due to constriction of the arterioles, which persists even after complete destruction of the cord, and which must therefore be due to direct action upon the musculature of the vessel walls. Langley suggests that this action is the

result of a definitely specific stimulation of the sympathetic nerve-endings.

It has been shown moreover that blood taken from the suprarenal vein during life produces similar effects to adrenalin though in a lesser degree, whereas blood from any of the other veins gives negative results. This shows that adrenalin is normally produced in the living body and thrown into the blood, where its function is evidently that of keeping up vascular tone.

There is also evidence to prove that adrenalin plays an important part in the neutralization of the toxic products of nervous and muscular work, especially perhaps "choline."

THERAPEUTICS OF ADRENALIN

Suprarenal extract was first introduced for the cure of **Addison's disease**, the symptoms of which are believed to be due to absence of the internal secretion of those glands. It has not however justified the hopes that were formed of it. Adams, who has analysed 97 cases in which it was used, has arrived at the conclusion that when administered by the stomach its effect is practically nil, but slightly better results have been obtained by the hypodermic administration of adrenalin. Some few patients have seemed to derive benefit but they have mostly relapsed later on, and therefore, bearing in mind the notoriously fluctuating character of the malady, it is impossible to be certain that this temporary improvement was the result of treatment.

The chief use of adrenalin nowadays is as a local hæmostatic, and internally as a **cardiac stimulant**. It also plays a very important part in delaying the toxic action of other drugs.

It has been employed with success as an application to all kinds of bleeding surfaces, as in **epistaxis**, **bleeding gums**, **piles**, **metrorrhagia**, &c., and on account of its property of constricting the arterioles it is often combined with cocaine or β -Eucaine in eye lotions and nasal sprays as well as in the production of infiltration analgesia. When used for the last-mentioned purpose however it has the undoubted drawback of causing a tendency to gangrene. The prolonged use of adrenalin moreover as an eye lotion is apt to set up troublesome chemosis of the conjunctiva and lachrymation. It appears to be especially valuable as an adjunct to cocaine in the production of spinal anæsthesia, as the experiments of Dönitz have shown that, after the subdural injection of 7 ms. of adrenalin chloride solution, five times the normal toxic dose of cocaine may be injected without any ill effects. On account of this property of lessening the toxic effects of other drugs, Hooker has proposed to employ it in the treatment of **snake-bite**. It has a specially marked action upon the peritoneum and is one of the most valuable **styptics** at our disposal for checking oozing when separating peritoneal adhesions.

Administered by the mouth it is useful in checking internal hæmorrhages of the "primæ viæ" as in gastric ulcer, typhoid fever and neoplasms : it is also of value in purpura and hæmophilia, but it has proved a failure in hæmoptysis. As a cardiac stimulant its action and uses are similar to those of digitalis, but it requires to be used with caution. Dr. K. C. Bose has pointed out that it is a valuable remedy in the second stage of plague. It may also be used in collapse or syncope following chloroform anæsthesia. Its use has been suggested in exophthalmic goitre but the results obtained so far have not been very satisfactory.

Acid Extract of Duodenal Mucous Membrane.

The fact that the tissues are unable, in the absence of the internal secretion of the pancreas, to utilize the dextrose variety of sugar, with the result that death occurs from acute diabetes, has been clearly proved by the experiments of Minkowski and v. Mering, whilst the recent observations of Cohnheim (Jnr.) have demonstrated that the pancreatic secretion alone has no power of oxidizing glucose : it requires the addition to it of muscle juice. Lastly, Bayliss and Starling have shown that the activity of pancreas is called forth by chemical agency by means of a substance termed by these authors "secretin" which is formed by the cells of the duodenal mucous membrane and carried to the pancreatic cells in the blood-stream.

It follows therefore that there are three places in the chain at which weakness due to functional or organic derangement may occur and lead to a metabolic breakdown and consequent diabetes, viz. :—

(a) The breakdown may be in the duodenum, so as to result in a failure of "secretin."

(b) The secretin may be carried to the pancreas, but the cells of that organ may fail to respond to excitation.

(c) Both the supply of secretin and the functional activity of the pancreas may be normal, but the muscles fail to perform their part of the work owing to non-production of the substance which assists the action of the pancreatic internal secretion.

The object, therefore, of organo-therapy in the treatment of diabetes is to complete the chain by supplying whichever of these secretions happens to be wanting.

So far very little success has attended the use of preparations of the pancreas. The ordinary glycerin extract appears to have no influence whatever on carbohydrate metabolism, but Lépine claims that he has obtained better results with the glycolytic ferment which he has isolated both from the pancreas and from the malt extract.

The writer is not aware that any use has yet been made of Cohnheim's discoveries ; he would suggest that the systematic use of raw meat juice is worth a trial.

The recent observations of Moore and Abram however lead one

to hope that a very successful form of treatment for certain classes of cases has been discovered in the administration of acid extract of duodenal mucous membrane (which of course contains secretin). It is obvious that this line of treatment will only be successful in that class of case in which the fault lies in the duodenum and in which there is no organic or functional derangement of the pancreas, but it happens that the cases in which the duodenum is primarily at fault are probably those intractable and rapidly fatal forms of the disease which are met with in children and young adults. If therefore this remedy can cure these acute cases it is an extremely valuable addition to our therapeutic resources.

Moore and Abram report that they have treated three children with it, and that in all of them there was a rapid disappearance of the sugar from the urine and that two of them are apparently perfectly cured. No sweeping conclusions can be drawn from such a small number of cases; still the prognosis in diabetes occurring in young children is so very unfavourable, that the results obtained are very remarkable and every opportunity should be taken to test this remedy in suitable cases.

The dose of extract is from 2 drs. to $\frac{1}{2}$ oz. three times daily, gradually increasing it up to 1 oz. It must always be fresh, as it will not keep more than four days even in a cool climate.

The method of preparation is as follows :—

The upper three or four feet of the small intestine of the pig (or sheep), obtained fresh from the slaughter-house is taken and laid open from end to end. The mucous surface is then rapidly washed with normal saline solution to free it from adherent matter, but the washing must not be continued for too long. The strip of intestine is then laid with the mucous surface upwards upon a glass slab, and the mucous membrane scraped off with a broad blunt knife. The scrapings are next passed through a mincing machine and the homogeneous soft semi-fluid mass which comes out is then thoroughly mixed for about 5 minutes in a mortar with an equal volume of a 0.4 per cent. solution of dilute hydrochloric acid.

The mixture is then placed in a beaker and sterilized by being raised to the boiling-point, during which process it must be constantly stirred with a glass rod. Finally, sodii hydrate is added until the mixture just remains acid to litmus paper. The coarse precipitated proteid is then allowed to settle and the clear fluid is decanted into a bottle which has been sterilized by boiling water, where it will keep well for 3 or 4 days. It is administered by the mouth, not by hypodermic injection.

Bone Marrow.

This is the bone marrow obtained from ribs and flat bones. It is a powerful leucocyte-stimulant and is used as a remedy in pernicious

anæmia, chlorosis, scurvy, purpura, hæmophilia, debility, leucocythæmia, lymphadenoma and rickets.

It can be administered in the fresh state but it is difficult to prepare, and it is better as a rule to use one of the various preparations that are on the market.

The following are some of the best known :—

1. **Bone Marrow Tabloids.**—3 grs. each. 1 gr. is equivalent to 20 grs. of fresh marrow. *Dose.*—1 to 3 tabloids.

2. **Marrubin.**—This is a glycerin extract of ox bone marrow. It is a thick brownish liquid, and is recommended as a palatable substitute for cod-liver oil. *Dose.*—1 to 2 drs.

3. **Virol.**—Is stated to be a mixture of bone marrow, malt extract, eggs and lime. Is agreeable in flavour and very suitable for administration to children. *Dose.*—1 to 2 drs.

4. **Myelocine.**—An ethereal extract of bone marrow, containing 1 per cent of chloretone. *Dose.*—10 ms.

The Liver.

The administration of either fresh liver in doses of 100 grms. daily, or of liver extract (prepared by extracting with water at 35° C.) in 1 grm. doses is recommended for the treatment of **hepatic cirrhosis**. The extract is given in milk in addition to the ordinary diet. It is claimed for this method of treatment that it causes cessation of hæmorrhages and disappearance of hæmorrhoids and ascites.

The Spleen.

Fresh spleen has been administered as a food in cases of **lymphadenoma** and **Graves' disease**, and it is alleged that the splenic principles are blood-forming and alterative and therefore likely to be of use in cases of **anæmia, chlorosis, rickets and phthisis**. An extract of bullock's spleen is said to improve the mental condition of insane persons. 1 dr. of the extract represents 1 dr. of fresh spleen. The dose is 1 to 3 drs., gradually increased to 1 oz. Landau has recently isolated from the spleen of the horse a highly ferruginous albuminoid to which he has given the name of "*Stagnin*." It is prepared as follows :—

The spleen is removed immediately after death, and kept on ice for 1½ hours. The pulp is then removed, with aseptic precautions, and rubbed up with double its volume of normal salt solution, made alkaline with sodic hydrate, and a little chloroform is added to prevent putrefaction. It is then allowed to stand for 48 hours, filtered and evaporated to one quarter of its volume, and precipitated with alcohol.

The dried precipitate forms **Stagnin**. When injected hypodermically it acts powerfully on all forms of capillary hæmorrhage, especially **menorrhagia** and **metrorrhagia**, but it has no action when applied locally. It does not appear to act on the vessel wall like adrenalin as there is no rise in blood-pressure: it seems rather to increase the coagulability of the blood.

Landau suggests that it should be tried in **hæmoptysis** where adrenalin is admitted to be a failure.

The Kidney.

Renaut recommends extract of pig's kidney in both **renal** and **cardiac dropsy**. It is prepared as follows:—Take one or two absolutely fresh pig's kidneys, chop them up fine, and wash thoroughly in water to remove all urine. Then pound thoroughly in a mortar with 12 ozs. of water and half a teaspoonful of salt, allow to macerate for 4 hours, and then decant. This amount is to be taken during the day, divided up into 3 or 4 doses. To make it less repugnant, it should be mixed with a little clear soup. The treatment should be continued for ten days at a time and then a rest of 5 days should be ordered.

This extract is a powerful **diuretic**, and it is said that it tends to restore the kidneys to a healthy action and reduces albuminuria.

The Sex Glands.

All these have been placed under contribution and even the placenta has not escaped. Placental extract and Chorionin are recommended to increase the flow of milk after parturition.

Tablets of ovarian substance (5 grs. each) are given for **chlorosis** on the supposition that this disease is due to absence of the internal secretion of the ovaries.

Spermin, Orchidin, Testiculin, Didymen are, as their names imply, all prepared from the male sexual organs.

They are recommended as **aphrodisiacs** and for the treatment of various forms of **nervous debility**, **locomotor ataxy** and **exophthalmic goitre**.

Lastly prostate gland substance is said to cause considerable reduction in the size of **enlarged prostates**.

Pituitary Extract obtained from the infundibular portion of the pituitary gland is stated to have a remarkable and lasting effect upon the **blood-pressure**. The blood-pressure is raised immediately when the injection is made intravenously, in from 5 to 30 minutes when given subcutaneously. Its most striking characteristic is that this rise of blood-pressure is maintained and is still observable after 12 to 24 hours. Hence it has been strongly recommended in the prevention and treatment of **shock** especially occurring during the anaesthesia

of severe surgical operation. It is a powerful **diuretic** and is often used to re-establish the flow of urine in **cholera**. As it causes uterine contraction and has a special action on uterine muscle it is one of the most valuable means of **strengthening weak labour pains**. It may also be used for its action on the uterus in all conditions where ergot is indicated. The dose is $\frac{1}{2}$ to 1 c.c. of 20 p.c. extract representing 0.1 to 0.2 grm. of fresh infundibulum. It can be obtained in sterilized solution in small glass globules ready for immediate injection.

INDEX

A		PAGE			PAGE
<i>Aarar ka tel</i>	.	478	Acidum Gynocardicum	.	432
Abernethy's Lotion	.	172	Hydrobromicum Conc.	.	191
Abbreviations	.	113	Dil.	.	191
A.B.C. Liniment	.	207	Hydrochloricum	.	191
<i>Abhaya</i>	.	505	Dil.	.	192
Abrastol	.	509	Hydrocyanicum Dil.	.	195
Absolute Alcohol	.	217	(Scheele)	.	196
Abstracts	.	26	Lacticum	.	197
Acaciæ Cortex	.	167	Dil.	.	198
Gummi	.	167	Nitricum	.	192
Acalypha	.	168	Dil.	.	192
Accelerator centre, action on	.	140	Nitro-hydrochloricum	.	
Accumulation	.	106	Dil.	.	192
A.C.E. Mixture	.	334	Oleicum	.	198
Aceta	.	16	Oxynaphthoicum	.	509
table of	.	16	Phosph. Conc.	.	193
Acetanilide	.	169	Dil.	.	193
Acetic Ether	.	215	Piericum	.	193
Acetophenone	.	544	Salicylicum	.	199
Acetopyrin	.	544	Scleroticum	.	390
Acetum	.	170	Sulphuricum	.	194
Hygrophilæ	.	456	Dil.	.	194
Mylabridis	.	505	Aromat.	17,	194
Acid, aromatic	.	17	Sulphurosum	.	205
Ext. of Duodenal Mucous	.		Tannicum	.	413
Membrane	.	706	Tartaricum	.	189
Acids	.	5	Trichloraceticum	.	170
diluted	.	17	Trichlorphenicum	.	185
table of	.	17	Acoine	.	355
Acidum Aceticum	.	169	Aconiti Radix	.	206
Glaciale	.	170	Aconitina	.	207
Dilutum	.	169	Aconitinæ Oleatum	.	207
Aceto-Salicylicum	.	199	Actæ Racemosæ Radix	.	341
Arseniosum	.	171	Active Immunity	.	685
Benzoicum	.	275	Actol	.	254
Boricum	.	181	Adeps	.	17, 209
Cacodylicum	.	177	Benzoata	.	17, 209
Camphoricum	.	307	Lanæ	.	210
Carbolicum	.	184	Hydrosus	.	18, 210
Catharticum	.	612	Myristicæ	.	507
Chromicum	.	188	Adhatoda	.	210
Chrysophanicum	.	252	Cigarettes	.	210
Citricum	.	189	Adhesive Plaster	.	21, 591
Gallicum	.	413	Adjuvant in a recipe	.	115

	PAGE		PAGE
Administration of drugs	102	Ammonio-Mercuric Chloride	442
Adrenalin Chloride solution	704	Ammonii Benzoas	275
Adulteration	7	Bicarbonas	234
Æther	211	Bromidum	284
Aceticus	215	Carbonas	233
Ethylic	211	Chloridum	235
Methylatus	211	Embelas	389
Sulphuric	211	Fluoridum	234
<i>Afm</i>	518	Iodidum	466
Affusion, cold	63	Phosphas	237
Agathin	200	Picras	234
Agropyrum	216	Salicylas	200
Agurin	651	Tartras	234
Air, drugs inhaled with	132	Valerianas	672
Airol	281	Ammonium	231
Ajacol	372	Sesquicarbonate	233
<i>Ajawan ke tel</i>	216	Amygdophenin	543
<i>Akarkara</i>	588	Amygdala Amara	237
Alabastrine	509	Dulcis	237
Albergin	254	Ammonol	169
Albulactin	598	Amyl Colloid	362
Alcohol	217	Nitris	238
Alembroth Gauze and Wool	442	Amylene Hydrochlor.	563
Salt	442	Amyloform	669
Alexandrian Senna	611	Amylum	241
<i>Alkatrá</i>	559	Iodatum	464
Alkaloids	4	Anæsthesine	355
table of	5	Anæsthetics, general	159
Almond Cosmetic Cream	238	local	155
Sweet and Bitter	237	Analgesics	154
Oil	238	<i>Anantamul</i>	436
Aloes, Barbados	224	Anaphrodisiacs	163
Socotrina	224	direct	163
Aloin	225	indirect	164
Alpha-Naphthol	509	Anarcotine	521
Alphol	509	<i>Anár ka chhál</i>	427
Alphozone	455	Andrographis	241
Alsol	228	Anemone	588
Alstonia	227	Anethi Fructus	242
Alternatives	152	Angustura bark	379
Alternative method of making		Anhydro-glucoc-chloral	328
waters	78	Anhydrotics or Antihydrotics	149
Alum	227	Anilipyrin	544
Exsiccated	228	Anisi Fructus	243
Aluminii Chloridum	228	Anodyne Colloid	362
Alumnol	228	General	158
Alypin	355	Hoffman's	211
<i>Amaltas</i>	324	Local	154
Ambiguous nomenclature	113	Tincture	521
Aminoform	669	Vesicant	313
Ammoniacum	230	Antacids	124
Ammoniated Phenylacetamide	169	Antacid lozenge	57

INDEX

713

	PAGE		PAGE
Antagonism . . .	107	Antrophores . . .	66
Antagonists . . .	109	Antivenene . . .	690
Anthelmintics . . .	130	Anusol . . .	282
Anthemidis Flores . . .	243	Anytin . . .	630
Anthrax, Serum for . . .	694	Aperients . . .	127
Anthraxobin . . .	562	Aphrodisiacs . . .	163
Anticholera Inoculation . . .	686	Apocodeinæ Hydrochlor. . .	532
Anticholagogues . . .	131	Apocynum . . .	249
Antidiphtheritic Serum . . .	689	Apolysin . . .	543
Antidysenteric Serum . . .	695	Apomorphinæ Hydrochlor. . .	532
Antiemetics . . .	126	Aqua . . .	18
central . . .	126	Destillata . . .	249
gastric . . .	126	Piois . . .	560
Anti-expectorants . . .	136	table of . . .	18-19
Antifebrin . . .	169	Arabin . . .	6
Antigalactagogue . . .	165	Arachis oil . . .	251
Antigonococcic Serum . . .	694	Araroba . . .	251
Antikamnia . . .	169	Arbutin . . .	671
Antimeningococcic Serum . . .	694	Argentamin . . .	254
Antimicrobic Sera . . .	691	Argenti Acetas . . .	254
Antimonii Oxidum . . .	244	Citras . . .	254
Salts . . .	245	Fluoridum . . .	254
Antinervin . . .	169	Iodidi . . .	254
Antiparasitics . . .	166	Lactas . . .	254
Antiperiodics . . .	166	Nitras . . .	253
Antiphlogistine . . .	423	Oxidum . . .	253
Antiplague Inoculation . . .	686	Argentol . . .	254
Serum . . .	695	Argentum Colloidale . . .	254
Antipneumococcic Serum . . .	694	Argonin . . .	254
Antipyretics . . .	152	Argyrol . . .	254
Antipyrina effervescens . . .	544	Aristochin . . .	345
Antipyrine . . .	543	Aristol . . .	460
Mandalate . . .	544	Aristolochia . . .	257
Caffeino-Citricum . . .	293	Armoraciæ Radix . . .	258
Salicylate . . .	544	Arnica . . .	258
Tablets . . .	544	Aromatic Acid . . .	17
Antiseptin . . .	169	sugars . . .	68
Antiseptin . . .	680	Arrhenal . . .	173
Antiseptic Gauze . . .	67	Arsacetin . . .	179
Cotton . . .	71	Arsamin . . .	178
Antiseptics . . .	165	Arsenic . . .	171
gastric . . .	124	Cigarettes . . .	172
intestinal . . .	130	Preparations of . . .	171-172
Antiseptol . . .	460	White . . .	171
Antisialagogues or Antisialics . . .	122	Arsenious Anhydride . . .	171
Antispasmodics, bronchial . . .	135	Arseno-Benzol . . .	179
Antistaphylococcic Serum . . .	694	Artificial Immunity . . .	685
Antistreptococcic Serum . . .	692	Asafetida . . .	260
Antitetanic Serum . . .	689	Asaprol . . .	509
Antithyroidin . . .	703	Aseptol . . .	185
Antitoxic Sera . . .	688	Aseptoline . . .	475
Antityphoid Inoculation . . .	687	Aspirin . . .	201

	PAGE		PAGE
Asteracantha	455	Benger's Liq. Pepticus	541
Asthma Cure	582	Benzanilide	544
Astringent, gastric	123	Benzoinum	274
intestinal	129	Benzoyl-pseudo-tropine	355
nasal	133	Benzol	277
vascular	142	Benzonaphthol	509
Atoxyl	178	Benzosol	372
Atropina	266	Berberis	277
Oleatum	266	Bertoni's Ether	239
Sulphas	267	Beta-naphthol Salicylate	509
Aurantii Cortex Recens	261	Betel	278
Indicus	262	Betol	509
Siccatus	261	Betul-ol	417
Aurantii Floris Aqua	262	Bherándá tel	594
Azadirachta Indica	262	Bháng	310
B		Bichloride of Mercury	441
Báblá chhál, Bábul ka chhál	107	Bijasar	481
Bábuná-ful	243	Bile, Purified ox	397
Bákas	210	Biranga	389
Balnea	62	Bismal	281
Balsams	5	Bismuth Cream	280
of Fir	646	Oxybenzoate	281
of Peru	263	Preparations of	280-282
Balsam of Tolu	264	Bismuthol	281
of Copaiba	367	Bismutose	281
Bári Sánf	411	Bitter Apple	363
Bases	5	Black Catechu	330
Basis for ointment	58, 100	Draught	39, 612
in a recipe	115	Haw	676
Basilicon Ointment	591	Mustard Seeds	615
Basham's Mixture	402	Pepper	558
Bassorin	6	Sassafras	578
paste	660	Snake Root	341
Bath	62	Wash	37, 443
Air	66	Willow	201
Cold, varieties of	63	Bladder, action on	147
Hot, varieties of	64-5	Blaud's Pill	43, 402
Medicated	65	Bleaching Powder	332
Table of	62	Bliss's Cure	582
Temperature of	66	Blistering Collodion	313
Vapour	65	Fly	313
Bearberry Leaves	671	Liquid	33, 313
Beer Yeast	326	Blisters	93
Beeswax, white	325	spreading of	93
yellow	325	Blood, action on	136-8
Bele Fructus	264	vessels, action on	142-4
Béle Kumrâr bij	377	Blue Pill	43, 439
Belladonnæ Folia	265	Ointment	60, 439
Radix	266	Stone and vitriol	378
Bengal Kino	290	Wound Stone	228
		Uction	440
		Body-heat, action on	152-3

INDEX

	PAGE		PAGE
Body-weight	105	Bynin	495
Bol, Bola	507	Amara	495
Bolus	66	Bynol	495
Bone Marrow	707		
Tabloids	708		
Boni's Blister	313		
Borax	182	Cacao Butter	651
Boric Acid	181	Cachets	66
Preparations	181	Cacodylates	177
Boro-glyceride	182	Caffeina	293
Borovertin	670	Preparations of	293-4
Botany Bay Kino	481	Cajuputol	296
Bottles, dispensing	75	Calabar Bean	551
graduation	76	Calamina Præparata	680
label on	74	Calcii-Boras	303
Bougies	66	Bromidum	286
Preparation of	96	Chloridum	298
of special drugs	96	Glycerophosphas	302
Branalcane	182	Hippuras	275
Brandy	47, 218	Hypophosphis	557
Mixture	218	Lactas	198
Bromal Hydras	286	Permanganas	584
Bromalbacid	286	Preparations of	296-303
Bromalin	285	Salicylas	200
Bromethyl Formin	285	Calcination	9
Bromides	284-9	Calcinol	303
Bromidia	285	Calomel	442
Brominol	285	Cream	443
Bromipin	285	Ointment	61, 443
Bromocarpin	475	Vegetable	569
Bromocoll	286	Caloricrescents	153
Bromoform	285	Calotropis	303
Bromo Hæmol	286	Calumbæ Radix	304
Phenol	185	Calx	300
Bromol	185	Chlorinata	333
Bromum	284	Sulphurata	303
Bromural	666	Cambogia	305
Bronchi, action on	135	Indica	306
Bronchial glands, action on	135	Camphoid	307
Broom Tops	609	Camphor	306
Brucine	511	Ball	307
Bruising	9	Monobromata	307
Bucco	289	Camphorated oil	307
Buchu	289	Camphoric acid	307
Buginarium Iodoformi et Eu-		Camphorodine	335
calypti	459	Camphyline	509
Burgundy Pitch	559	Canadian Hemp	249
Burnett's Fluid	679	Canada Balsam	646
Butes Gummi	290	Cannabinæ Tannas	310
Semina	291	Cannabinon	310
Butyl-Chloral Hydras	291	Cannabis Indica	310
Byne	495	Cantharidin	313

	PAGE		PAGE
Cantharis	313	Cathartic Acid	612
Hair oil	314	Cathartics	128
Cantharis Lotion	314	Catheter oil	184
Canton's Phosphorus	303	Caustics	144
Caoutchouc	316	Caustic, Lunar	253
Capillaries, action on	143	Mitigated	253
Capsicin	317	Potash	571
Capsici Fructus	316	toughened	253
Capsules	67	Causticum Zinci Chloridi	677
of Amyl nitrite	239	Celerina	677
of Castor oil	595	Celloidin	362
of Cod-liver oil	500	Cephaeline Hydrochloride	470
of Sandal-wood oil	600	Cerates	67
of Tar	561	Ceratum Calaminæ	680
Caraway Fruit	319	Cocainæ	354
Carbamide	664	Cera Alba	325
Carbanilic Ether	667	Flava	325
Carbasa Antiseptica	67	Cerebellum, action on	160
Carbazotic Acid	193	Cerebral depressants	157
Carbo Ligni	318	stimulants	157
Carbolic Acid	184	Cerasin	6
Preparations of	184-5	Ceredin	326
Carbonis Bisulphidum	318	Cerevisiæ Fermentum	326
Cardamomi Semina	319	Cerii Oxalas	326
Cardiac depressants	140	Cerosin	537
ganglia, action on	141	Cerumen, action on	163
stimulants	140	Cetaceum	327
tonics	140	Chalk Mixture	297
Cardio-inhibitory centre, action on	140-41	Precipitated	297
Carlsbad Salt, Artificial	618	Prepared	297
Water	618	Chamomile	243
Carminatives	125	Channels for administration	102-4
Carmine	359	Charas	310
Carniferrin	403	Charta	19
Carron Oil	300	Sinapis	19
Caryophyllum	320	Châtin	227
Casca Bark	384	Chaulmoogra Oil	432
Cascara Cordial	322	Charta Nitrata	582
Elixir	322	et Chlorata	582
Sagrada	322	Chebulic Myrobalans	505
Cascarilla	323	Chelsea Pensioner	430, 638
.	324	Chemical Food	401
Castor Oil	594	Cherry Laurel Leaves	483
Castile Soap	603	Chian Turpentine	650
Casumen	598	Children, prescription for	117
Cataphoresis	103	Chillie Paste	58, 317
Cataplasmata, Cataplasms	67	Chinâ bádâmer tel	251
Varieties of	67	Chinese white	680
Catechu	324	Chinoidinum	345
Pallidum	325	Chinoline Tartras	544
Nigrum	325	Chinosol	560
		Chinotropine	669

INDEX

717

	PAGE
Chiretta	327
Chloral Camphoratum	328
c. Cocaina	328
Formamide	328
Hydras	328
Chloralamid	328
Chloral Urethane	667
Chloralose	328
Chloralum	228
Chloretone	291
Chloric Ether	47, 334
Chlorinated Lime	332
Chlorine gargle	579
Chlorobrom	328
Chlorodyne	55, 335
Chloroform tinctures	67
Chloroformum	334
Aconiti	207
Belladonnæ	266
Camphoratum	334
Hyoscyami	456
Chloro-Sodio-Magnesian Aperient	618
Chlorphenol	185
Chlorum	332
Chocolate	651
Cholagogues	131
Chologen tablets	569
Cholera and Diarrhœa Mix.	297
Chrisma	538
Chriminaline	538
Christison's Pills	364
Chromic Anhydride	188
Chrysarobin	252
Chrysophanic Acid	252
Chun	300
Centine	365
Cigarettes	67
Arsenical	172
Ciliary muscle, action on	162
Cnicifugæ Rhizoma	341
Cinchona	341
Febrifuge	342
Cinchonæ Rubræ Cortex	341
Cinchonidine Sulphas	342
Cinchoninæ Sulphas	342
Cinchonine Ioc. -Sulphate	460
Cineol	394
Cinnamomi Cortex	351
Cissampelos	352
Citral	485
Citrine Ointment	61, 443

	PAGE
Strophen	543
Clarification	9
Clarified Honey	496
Clemen's Solution	172
Ioves	320
Lutton's Febrifuge Spirit	211
Clysters	68
Cocæ Folia	352
Cocaine	353
Preparations of	353-5
Suppository	49
Cocculin	555
Coccus	359
Cochineal	359
Cocoa	651
Cod-liver Oil	500
Capsules	500
Codeina	534
Codeine Iodate	534
Phosphate	534
Pastils	534
Codeinum Hydrochlor.	534
Colchici Cormus	360
Semina	360
Colchicine	360
Salicylate	360
Colchi-Sal	360
Cold Bath	63
Cream	58, 596
Coley's Fluid	699
Collargol	254
Collodion	19, 362
Ichthyol	630
table of	19
Collodium	362
Anodynum	675
Belladonnæ	266
Cocainæ	354
cum Iodoformo	459
Salicylicum	200
Salol	205
Stypticum	362
Zinci Chloridi	678
Colloid, Amyl	362
Anodyne	362
Collunaria	67
Collutoires	68
Collyria	68
Collyrium Adstringens	
Luteum	679
Colocynthis Pulpa	363
Colophony	591

3
1
6
13
33
64
65
72
98
154
159
262
321
460
189

	PAGE		PAGE
Decoctum Agropyri	216	Diosma	289
Cinchona	342	Direct action	120
Cissampeli	352	Directions to patient	116
Eucalypti Gummi	393	Disinfectants	165
Gossipii Radicis Corticis	427	Di-Sodium methyl arsenato	178
Hygrophilæ	456	Dispensing	1, 74
Ispaghulæ	473	general directions for	74-6
Papaveris	537	room	74
Sappan	604	Dispermio	669
Decoloration	10	Distillation	10
Deliquescents	4	destructive	10
Delirians	157	dry	10
Delivery, wrong	76	fractional	10
Demulcents	123	Dithymol Iodide	460
Dentifrices	68, 121	Dithion	197
Deodorants	165	Dita Bark	227
Depilatories	68, 150	Diuretics	144
Derivatives	144	table of	145
Dermatol	282	varieties of	145
Dermosapol	501	Diuretin	651
Despumation	10	Donovan's Solution	172
Desiccation	10	Dosage	104
De Valangin's Solvent	171	circumstances affecting	104-6
Dextroform	669	Dose, adult	104
Dextrose	421	calculation of	104
<i>Dhāni lankā</i>	316	grouping of	107
Diabetin	421	maximum	104
Di-acetyl tannin	414	minimum	104
Diachylon Ointment	566	Dover's Powder	45, 520
Plaster	565	Dropping	77
Dialysed iron solution	403	Drops, size of	77
Dialysis	10	Drug eruptions	150
Diaphoretic, Sedative	148	Drugs, administration of	102
Stimulant	148	characters of	3
<i>Dhaniā</i>	370	classification of	121
Diarrhoea Mixture	297	collection of	2
Diethyline-diamine	669	combination of	110
Digallic Acid	413	composition of	4
Digestion	10	impurities of	7
Digitalin	381	pharmacology of	119
Amorphous	382	poisonous	74
Crystallized	382	source of	2
German	382	testing of	74
Pure	382	Drying	10
Digitalis Folia	381	<i>Dudhiābīsh</i>	206
Digitoxin	382	Duodenal stimulants	126-7
Di-iodoform	460	Mucous Membrane, Ex- tract of	706
Di-iodo-Salicylic Acid	460	Duodenum, action on	127
Dill Fruit	242	Duotal	372
Dill Water	242	Dwale Leaves	265
Diluted Hydrogen Cyanide	195	Dymal	201
Dionin	523		

	PAGE		PAGE
E		E	
Ear, action on	162	Emetics, Gastro-Central	126
Earth-nut oil	251	Emetine Hydrochlor.	470
East Indian Senna	611	Hydrobrom.	470
Easton's Pills	401	Emetine Vinum	470
Syrup	50, 400	Emmenagogues	164
Eau de Goudron	561	Emollients	149
de Luce	232	Emplastra	21, 94
Maiche	454	table of	22
Ecbolics	164	Emplastrum Belladonnæ Viride	266
Effervescent Granular	21	Fluidum	266
table of	21	Calefaciens Mylabridis	505
Effervescent Antipyrine	544	Capsici	317
Epsom Salts	493	Cocainæ	354
Pulvis Salis Carolini		Mylabridis	505
Factitii	618	Emulsio Iodoformi	459
Sodium Salicylate	199	Olei Morrhuæ Co.	501
Sodio-Magnesi Sulphas	618	et Hypophos.	501
Efflorescents	4	Olivæ Co.	517
Egg Flip	39, 218	Petrolei cum Hypophos- phitibus	538
Ehrlich-Hata	179	Emulsion, Pancreatic	535
Eka Iodoform	460	Emulsions	68
Ektogan	454	compounding of	79, 81
Elachi	319	of special drugs	81-4
Elæosacchara	68	Endermic medication	103
Elaterinum	388	Enema Opii	520
Elaterium	388	Olei Ricini	595
Electuaries	19	Enemata, enemas	68
Elegant prescriptions	116	varieties of	69
Elder Flowers	599	Enepidermic	103
Elixiria	68	Enesol	440
Elixir ad longam vitam	225	Enteroclysis	68
Cocæ	353	Enules	69
Glusidi	421	Ephedrine Hydrochloride	267
Guaranæ	431	Epicarín	509
of Vitriol	17, 194	Epidermic medications	103
of Cascara	322	Epispastics	143
Pectorale	425	Eosote	371
Papaini	536	Epsom Salts	492
Paregoric	520	Ergota	389
Phosphori	548	Ergot of Rye	389
Rhei	592	Ergotin	26, 390
Sennæ	612	Ergotinina, Ergotinine	390
Sodii Cacodylatís	177	Citras	390
Viburni Prunifolii	677	Errhines	133
Simple	261	Erythrol	282
Elutriation	19	Nitrate	661
Embelia	389	Erythrophloeum	385
Embrocation	30	Escharotics	143
Emetics	125	Eserine Sulph.	552
Central or Remote	126	Essence of Chiretta	328
Gastric or Local	125	Ether	211

	PAGE		PAGE
Ether Aceticus	215	Extractum Adhatodæ Liq.	210
Chlorio	334	Agropyri Liq.	216
Methylatus	211	Aloes Socotrinæ	225
Nitrous	214	Apocyni Fld.	249
Ozonio	45	Belæ Liq.	265
Soap	60	Belladonnæ Fol.	
Sulphuric	21	Alcoholicum	266
Ethyl Bromide	28	Berberidis	278
Chloral Urethane	66	Capsici Fld.	317
Nitrite, Solution of	21	Cascaræ Sagradæ Liq. et	
Oxide	21	Ins.	322
Urethane	66	Cissampeli Liq.	352
Eucaino Hydrochloride	35	Conii Liq.	365
Eucalypteol	39	Convallariæ	367
Eucalypti Gummi	39	Fld.	367
Folia	39	Elatorii	388
Olcum	39	Ergotæ Fld.	390
Eucalyptol	39	Erythroxyli Fld.	353
Eucalyptus dressings	39	Eucalypti Gummi Liq.	393
Eucasol	63	Euonymi Liq.	396
Euchinine	34	Glycyrrhizæ Spirituosum	425
Eudoxin	28	Gossypii Radicis Corticis	
Eumydrine	20	Liq.	427
Eunatrol	60	Grindeliæ	429
Euonymi Cortex	39	Liq.	429
Euonymin	20, 39	Hæmatoxyli Liq.	434
Euphorin	60	Hydrastis	462
Euphthalmine	26	Iridis	472
Euquinine	34	Kavæ Liq.	480
Euresol	56	Kolæ Liq.	294
Europhen	40	Kramerizæ Fl.	483
Evacuants	12	Lupuli	490
Evaporations	1	Lupulini Fld.	490
Exalgin	54	Malti	495
Excipient in a recipe	11	Liq.	495
for pills	8	Ferratum	495
Exhilarants	11	c. Oleo Morrh.	495
Exodin	50	Mezerii Æthereum	500
Expectorants, group of	1	Olei Morrhuzæ Alcohol.	501
Explosive combinations	10	Pancreatis	535
Expression		Papaveris	537
Extract, Pond's	4	Picrorhizæ Liq.	555
Extracts		Sennæ Liq.	612
group of	23	Thyroidei Liq.	656
Aqueous		Viburni Prunifolii	677
Alcoholic		Liq.	676
Dry	3	Eye, action on	160
Ethereal	3	Extraction	30
Fresh			
Green	3		
Liquid	4	Fax Medicine	
Extractum Acalyphæ Liq.		Belladonnæ	

Gelseminine	418
Hydrochlor.	418
Generative system, action on	163
Gentianæ Radix	419
Geosote	372
Gin	216
Ginger	683
Gingilli Oil	614
Glaser's Salt	586
Glass, Soluble or Water	629
Glauber's Salt	618
Glonein Oil	660
Glucauth	86
Glucose	421
Syrup of	599
Glucosides	5
Glucosimide	599
Glucosimido	421
Glusidum	421
Glutino-peptonate of Corrosive Sublimate	442
Glutol	669
Glycaphorm	523
Glycerinum	422
Acidi Salicylici	200
Belladonnæ	266
cum Aqua Rosæ	422
Ferri, Quininae et Strych. Phosph.	401
Hydrastis	452
Iodi	634
Ipecacuanhæ	470
Papain	536
Pepsini Fort.	541
Sodii Cinnamate	626
Thymolis Co.	654
Glycerin Soap, liquid	603
Glyceritum Vitelli	423
Glycerins	27
table of	27
Glycerin Jelly	422
Glycero-alcohol	422
Glycerol	422
Glycerole of Heroin	523
Easton	401
of Pepsin	541
Glycero-phosphate of Calcium	302
Glyco-Heroin	523
Glyco-Thymoline	655
Glyconin	423
Glycyrrhizinum-Ammoniatum	425
Glycyrrhizæ Radix	425

	PAGE
Glycogenic depressants	132
stimulants	131
Glymol	538
Glycosal	201
Goa Powder	251
Golap phul	596
Golmarich	558
Golden Ointment	61, 441
Seal	452
Gorit	303
Gossypia Antiseptica	71
Gossypii Radicis Cortex	426
Gossypium	426
Krameria	483
Menthol	498
Goulard Water	564
Goulard's Extract	35, 564
Lotion	35, 564
Granati Cortex	427
Grain, division of	77
Granulation	11
Granules	71
Grape Sugar	421
Guinea Pepper	316
Green Mountain Cure	582
Soap	603
Gregory's Powder	45, 592
Grey Oil	439
Powder	439
Griffith's Mixture	38, 399
Grindelia	428
Ground Nut Oil	251
Guaiacetin	372
Guaiaci Lignum	430
Resina	430
Guaiacol	371
Benzoas	372
Cacodylas	177
Preparations	371-2
Guaiiform	371
Guæthol	372
Guarana	431
Guaranine	293
Gulancha	658
Gums	6
Action on	121
Gum-resins	6
Gum Acacia	167
Benjamin	274
Gummi Indicum	432
Guttæ	71
Hysocine	457

	PAGE		PAGE
Iatroleptic medication	103	Injections, Parenchymatous	103
Ice-bag	64	Rectal	68
Ichthalbin	630	table of	29
Ichthargan	254, 630	Injectio Curaræ Hypodermica	664
Ichthyol	630	Ergotinina	390
Collodion	630	Hydrag. Iodi. Rub. Hypo-	
Paste	630	dermica	440
Idiosyncrasy	105	Iodidi (Pro vagina)	440
Immunity, Active	685	Hyoscina Hypodermica	457
Passive	685	Hyoscyamina	456
Imperial drink	574	Morphina et Atropina	
Incineration	9	Hypodermica	521
Ince's precautions	87	Nitroglycerini Hypo.	661
Incompatibility	107	Physostigmina Sulph.	
Chemical	108	Hypodermica	552
Physical	108	Sodu Salicylatis	200
Physiological	109	Sulphatum	680
Indian Birthwort	257	Zinci Sulphatum	680
Gamboge	306	Inoculation	103
Gum	432	Inscription in a recipe	115
Henp	310	Insufflatio Iodoformi	457
Oil of Verbena	427	Eucalypti Gummi	393
Orange Peel	261	Menthol et Cocainæ	499
Podophyllum	571	Insufflations	71
Sarsaparilla	436	Intestin	281
Squill	668	Intra-ocular tension, action on	162
Valerian	674	Inverted Sugar	421
India-rubber	316	Iodalbacid	464
Indrabâruni	363	Iodantipyrino	464
Indrajab	473	Iodine	463
Indirect action	120	Preparations of	463-4
Infusion	11, 28, 78	Iodinol	464
Concentrated	79	Iodipin	464
table of	28-29	Iodized Phenol	185
Infusum Alstoniæ	227	Starch	464
Andrographis	241	Iodo-Caffeine	293, 464
Azadirachtæ	262	Iodocresol	461
Berberidis	278	Iodoform	459
Coscini	370	Dressings	459
Cocæ	353	Varnish	459
Digitalis Con.	381	Iodoformal	460
Gentianæ Comp. Conc.	420	Iodoformin	460
Jaborandi	474	Iodoformogen	460
Nucis Vomica	511	Iodoformum Bituminatum	460
Tinosporæ	658	Præcipitatum	459
Toddaliæ	659	Iodo-glycerin solution	463
Ingluvin	541	Iodol	460
Inhalations	73	Iodopyrin	464
group of	132-33	Iodosalicylic Acid	460
Injections, Injectiones	71	Iodo-theobromin	652
Hypodermic	29	Iodothyrim	464, 658
		Iodum	463

	PAGE		PAGE
Lassar's Paste	681	Liquores, table of	32-36
Laudanum	54, 520	Liquor Alumini Acetici	228
Laurocerasi Folia	483	Ammonii Acetatis	234
Lavandulæ Oleum	484	Fort.	234
Lavements	68	Ammonii Citratis	234
Law of dissolution	157	Ammonii Citratis Fort.	234
Laxatives	127	Andrographidis Concen-	
Lead	563	tratus	242
Sugar of	564	Antisepticus	560
White	565	Aristolochiæ Conc.	257
Leioithin	484	Arsenici Bromatus	172
Leeches	437	Aurii et Arsenii Bromidi	172
Leiter's Coil	64	Berberidis Conc.	278
Lemon juice	189	Bismuthi	280
peel	485	Conc.	281
Lemonade Purgative	492	Bromo-chloral Co.	285
Lens, action on	162	Carbonis Detergens	559
Levigation	11	Chlori	332
Levulose	421	Copaibæ	368
Levurine	326	Coscinii Conc.	370
Light Magnesia	491	Epispasticus Mylabridis	505
Lime	300	Ergotæ Ammoniata	390
Water	300	Aceticus	390
Juice and Glycerin	238	Euonymini	396
Limonis Cortex	485	et Cascaræ	396
Succus	189	Iridini	396
Linctus, Lincturo	71	Ferri Chloroxydi	402
Apomorph. c. Codeina	532	Dialysatus	403
Codeinæ	534	et Ammon. Acet.	402
Ipecac.	470	Hypophosph. Co.	404
Morphinæ	522	Fort.	404
Pini, Terpin, et Acetomor.	557	Iodidi	403
Sedativus	522	Peptonati	404
Linimenta, liniments	30	Phosph. Fortis	401
table of	30-32	Sub-sulphatis	402
Linimentum Aconiti Co.	207	Hypophosphitum Co.	404
Calaminæ	680	Iodi	463
Camphoræ Co.	307	Magnesiæ Bromidi	492
Capsici	317	Morphinæ Bimeconatis	520
Exsiccans	660	Opii Sedativus	520
Menthol	498	Pectoralis	425
Iodi	463	Pancreatis	535
Opii Ammoniatum	520	Pepticus	541
Pot. Iodidi	466	Picrotoxini Aceticus	556
Linseed Meal	486	Potassæ Arsenitis	171
Linum, lints	72	Santali Co.	600
Linum	485	Sodæ Chlorinatæ	332
Contusum	486	Thymol	654
Liparin	517	Co.	654
Liquefaction	11	Tinosporæ Conc.	658
Liquores, liquors	32	Toddaliæ Conc.	659
concentrated	36	Liquorice	425

	PAGE		PAGE
Metabolism, action on . . .	150	Moschus . . .	503
Meta tri-iodo Cresol . . .	461	Motor paralyzers . . .	155
Methylene Blue . . .	562	stimulants . . .	155
Mezerei Cortex . . .	499	<i>Mouri</i> . . .	243
<i>Mithakadu ka bij</i> . . .	377	<i>Mrganávi</i> . . .	503
Methyl di-iodo-Salicylate . . .	461	Mucilaginæ, Mucilages . . .	39
Salicylas . . .	416	Mucilago Gummi Indici . . .	432
Acetanilide . . .	544	Mudar . . .	303
Microcidine . . .	509	<i>Mudra Sung</i> . . .	565
Migranin . . .	294	<i>Muktabarshi</i> . . .	168
Milk, action on . . .	165	<i>Mungphal ke tel</i> . . .	251
Artificial Human . . .	597	Muriatic Acid . . .	191
Dried . . .	598	Muscles, action on . . .	153
Peptonized . . .	535	<i>Musabir</i> . . .	224
Sugar . . .	597	Musk Root . . .	643
of Sulphur . . .	638	Mustard . . .	614
of Thyroidectomized Goat . . .	703	Mutton Suet . . .	614
Minim, division of . . .	77	Mydriatics . . .	161
Mistura Alba . . .	492	Mydrine . . .	267
Antidipsomania . . .	342	Myelocine . . .	708
Apomorphinæ et Terebin . . .	646	Mylabris . . .	504
Bismuthi Co. . .	281	Myotica . . .	161
Butyl chloral . . .	291	Myrobalanum . . .	505
Ferri Aromatica . . .	396	Myristica . . .	506
Grindeliæ . . .	429	Myrrha . . .	507
Hepatica . . .	322		
Moschi . . .	504	N	
Olei Olivæ . . .	517	Naphthaleno . . .	509
Rhei c. Soda . . .	502	Naphthalol . . .	509
Santali Co. . .	600	Naphthol, α . . .	509
Terebinthinæ Chiæ . . .	650	Aristol . . .	461
<i>Mieri</i> . . .	599	Naphthol, β . . .	508
Mitigated caustic . . .	253	Benzoyl . . .	509
Mixture . . .	38	c. Camphora . . .	509
compounding of . . .	79-81	Narcocina . . .	521
of special drugs . . .	81-84	Narcotics . . .	158
table of . . .	38-39	group of . . .	158
Möbius's Serum . . .	703	Narcotina . . .	521
Mollin . . .	603	Nargol . . .	326
Mollinum . . .	72, 101	Nasal astringents . . .	133
<i>Mom</i> . . .	325	sedatives . . .	133
Monk's hood . . .	206	Nasrol . . .	294
Monobromacetanilide . . .	169	Nauheim bath . . .	65
Mono-phenetidin citrate . . .	543	Nebulæ . . .	72
Monoi . . .	584	Nebula Acidi Lactici . . .	198
Monseil's Solution . . .	402	Cocainæ Oleosa . . .	354
Morphina . . .	522	Iodoformi . . .	459
Morphinæ Acetas . . .	521	Neem Bark . . .	262
Preparations of . . .	521-23	Nepenthe . . .	521
Morrhux Oleum . . .	500	Nervous system, action on . . .	154-60
Morrhuol . . .	501	<i>Nemburas Nambu ka arak</i> . . .	189
Morton's Fluid . . .	463		

INDEX

731

	PAGE		PAGE
Oleum Olive	516	Panama Bark	590
o. Acido Oleico	517	Pancreas, drugs acting on	132
Phosphoratum	548	Pancreatis Liquor	535
Pimenta	557	Pancreatin	535
Pini	557	Pangaduine	501
Ptychotis	216	Papain	536
Ricini	594	Papaveris Capsule	537
Rosa	596	Papayer <i>dtd</i>	536
Rosmarini	597	Papers	
Santali	600	folding of	92
Sesami	614	waxed	92
Sinapis Volatile	615	Para-acet Phenetididn	542
table of	40-41	Monochlor Phenol	185
Terebinthinæ	647	Paraffinum Durum	537
Theobromatis	651	Liquidum	538
Oliveri Cortex	518	Mollo	538
Olive oil soap	603	Paraffin wax	537
Olfactory apparatus, action on	133	Parasform	669
Opium	518	Paraldehyde	539
Opodeldoo	31, 72, 603	Parasiticides	166
Orange Wine	218	Paregoric	55, 520
Ordeal Bean	551	Elixir	520
Orexine Tannate	563	Scotch	58, 520
Organo-Therapy	701	Paireira	540
Oro-nasal inhalation	371	Parrish's Chemical Food	401
Orphol	281	Syrup	401
Orsudan	179	Paroleine	538
Ortho-naphthol	509	Pasque flower	588
Orthoform	355	Pasta, Pastes	72
Monobromphenol	185	Arsenicalis	172
Otto of Rose	41, 596	Arseni Escharotica	173
Ouabain	634	Amyli Iodidi	484
Ouari	664	Copaibæ	368
Ovo-Lecithin	484	Ichthyol	630
Oxycamphor	307	Londinensis	617
Oxydol	454	Potassa c. Calce	572
Oxidizing substances	93	Zinci Chloridi	678
Oxytocics	164	Co.	681
Oxygen gas	454	et Gelatini	681
water	454	Paste, Coster's	463
Oxysparteina	609	Chillie	317
Oxysparteinae Hydrochlor.	609	Lassar's	681
Ozokerine	538	Vienna	572
Ozonie Ether	454	Ward's	558
Ozone Paper	582	Pastillus, Pastils	72
		Cocaine Hydrochlor.	354
		Codeinæ	534
		Iodoformi	459
		Sulphuris Co.	639
		Thymol	654
		Pearl-coating	91
		Pearson's Solution	172

	PAGE		PAGE
Pectin	9	Phenyl Urethane	667
Pediculi, action on	166	Phesin	543
Pellitory Root	588	Phosote	371
Pelleterina Sulphas	428	Phosphates, saccharated wheat	551
Tannas	428	Phosphorus	547
Pencils	72	Phosphotal	371
Pepper, Black	558	Photoxylin	362
Peppermint Lozenge	497	Physostigmatis Semina	551
Syrup	497	Physostigminæ Hydrobro-	
Pepsin	541	midum	552
Tablet	541	Salicylas	552
Pepsinum Saccharatum	541	Sulphas	552
Peptone	541	Pick-me-up	234
Peptonized milk	535	Picrasmin	589
Percolation	11, 91	Picrorhiza	555
Perles	72	Picrotoxin	555
of Phosphorated oil	548	Pigmenta, Pigments	72
Permanganate of Potassium	583	Pigmentum Acidi Borici	182
of Sodium	584	Antisepticum	185
of Zinc	584	Argenti Nitras Æthereum	254
Peronin	523	Chrysarobini	252
Pessaries	72	Iodi et Oleo Picis	463
compounding of	96	Mandl	463
Petit's Liquor	422	Menthol	498
Petroleum Jelly	538	Picis Liq.	561
Petrosulful	630	Pill, Bland's	402
Pharbitis Nil	479	Blue	439
Pharmaceutical processes	8	Christison's	364
Pharmacy	1, 74	coating	90
extemporaneous	1	compounding of	84-86
official	1	Easton's	401
Pharmacodynamics	1	Excipients	86-87
Pharmacology	1, 119	Guy's	386
general	119	Hamilton's	364
Pharmacopœia, British	8	Niemeyer's	388
Pharmacopœial preparations	16-61	of special drugs	87-90
Phenacetinum	542	Plummer's	443
Effervescens	543	Silvering	90
Phenazonum	543	Pilocarpinæ Hydrochloridum	474
Phenic Acid	184	Nitras	474
Phenocoll Hydrochloridum	543	Phenas	474
Phenol	184	Salicylas	475
Bismuth	281	Pilocarpine	474
Camphor	185	Carbolate	474
Iodized	185	Hair lotion	474
Phenolphthalein	547	Pilulæ, Pills	42
Phenyl Acetamide	169	table of	42-44
Phenyl Alcohol	184	Pilula Acidi Carbolici	184
Benzamide	544	Aloini Co.	225
Dimethyl Pyrazolone	543	et Podoph. Co.	569
Hydrate	184	Andrographidis Co.	242
Salicylate	204	Asiatica	17

	PAGE		PAGE
Pilula Butyl-Chloral	291	Points of Zinc Sulphate	680
Codeinæ Co.	534	and Alum	680
Conii Co.	365	Pollantin	695
Ferri Carbonatis	399	Pomades	72
Iodidi	403	Pomegranate Bark	427
Quininæ et Strych- ninæ Phosph.	401	Pond's Extract	435
Valerianatis	673	Poor Man's Plaster	559
Hyd. et Digitalis Comp.	382	Poppy Capsules	537
Ipecac. c. Urginea	470	Red	594
Nitroglycerini	661	Posology	104
Pancreatica	535	Circumstances affect- ing	104-107
Picis Liquidæ	561	<i>Postodhenri</i>	537
Strophanthi	634	Potassa Sulphurata	641
Terebinthinæ Chiæ	650	Potassii Benzoes	275
et Zinci	650	Bromidum	284
Trium Valerianatum	673	Cantharidas	314
Zinci oxidî et Belladonna Valerianatis	681 673	Iodidum	466
Pimenthol	498	Potassio-Tartrate of Anti- mony	245
Pimenta	556	Potassium	571
Pini Oleum	557	Guaiacol Sulphonate	372
Pinol	557	Oxychinolin Sulphate	345
Piperazine	669	Preparations of	571-86
Quinate	670	Potus Imperialis	574
Piper Nigrum	558	Poultices	67
Piperidine Guaiacolate	558	Ice	67
Tartrate	558	Neem	67
Piperinum	558	Tokmalanga	67
Piperonal	558	Powders	44, 92
Pix Burgundica	559	compounding of	92, 93
Carbonis Præparata	559	tables of	45-46
Liquida	560	Precipitated Chalk	297
Plasma, action on	136	Sulphur	638
Plasmon	598	Precipitation	11
Plasters	21, 94	Prepared Calamine	680
Mammary	95	Prescribing, art of	112
Spreading of	21, 94	Prescriptions, directions in	75
Plumbum	563	abbreviations in	113
Preparations of	564-66	dispensing of	75
Plummer's Pill	43, 443	elegant	116
Pneumococcin	648	for children	117
Podophylli Indici Resina	571	label of	75
Rhizoma	571	positions of	75
Resina	569	reading of	75
Rhizoma	568	repetition of	76
Podophyllin	569	weights and measures in	112
Podophyllotoxin	569	writing of	115
Poison Nut	510	Primary action	120
Poisonous combination	110	Proctor's Paste	27
drugs	74	Proof Spirit	217
Po-ho-yo	498	Proponal	666

	PAGE		PAGE
Season, influence of	106	Sodii Cacodylas	177
Secale Cornutum	389	Hippuras	275
Secondary action	121	Hypophosphis	556
Sedatives, gastro	124	Hyposulphis	206
nasal	133	Iodidum	466
respiratory	134	Oleas	603
urinary	147	Para-aminophenylarsonas	178
Seidlitz Powder	46, 617	Peroxidum	454
Seignette's Salt	617	Salicylas	199
Senegæ Radix	610	Santonas	60
Senna Alexandrina	611	Sodium	617
Indica	611	Biborate	482
Sensory nerves, action on	154	Caffeine Iodide	293
Serpentaria	613	Caseinate	498
Serum-Therapeutics	685	Dimethyl Arsenate	177
of Thyroidectomized Sheep	703	Dioxide	454
Sesami Oleum	614	Phenol Sulphonate	639
Sevum Præparatum	614	Preparations of	617-32
Phosphoratum	614	Thiosulphate	206
Sex Glands, the	709	Solids	52
Sherry	218	Soluble Glass	629
Shetsâr	241	Copaiba	368
Shiga's Antidysenteric Serum	695	Gluside	421
Shohâgâ	182	Soluroil	702
Shorâ	582	Solution	2
Sialagogues	122	Saturans	182
Sidonal	670	Saponis Etheræa	603
Sifting	12	Somatose	599
Signature in a recipe	115	Ferro	408
Silicate of Sodium Solution	629	Somnal	667
Silver Nitrate	253	Sondâler âtâ	324
Oxide	253	Sonf	243
Simple Elixir	261	Soporifics	157
Sinapis	614	Soyâ	242
Sisa	563	Sozal	185
Skin, action on	147-50	Sozoiodol	461
Slaked Lime	300	Sozolic Acid	185
Small Chillies	316	Spanish Fly	313
Smelling Salts	234	Sparteins Sulphas	604
Snake-root	613	Spearmint, Oil of	497
Black	341	Spermaceti	327
Snuff, Ferrier's	281	Sphagnol	631
Soamin	173	Spinal depressants	154
Soap Bark	590	stimulants	154
Ether	603	Spindle Tree	394
Socotrine Aloes	224	Spirits	4
Soda	621	Spirit of Salts	19
Tartarata	617	of Chloric Ether	33
Sodæ Tartarata Effervescens,		of Mindererus	42
Pulvis	617	of Sal volatile	48
Sodii Benzoes	275	of Turpentine	
Bromidum	285	table of	

	PAGE		PAGE
Theobromatis Oleum	651	Tinctura Arnice Florum	259
Theocin	651	Azadirachtæ Indicæ	262
Thephorin	652	Benzoini Simplex	274
Therapeutics	1	Berberidis	278
Accessory	2	Calotropis	36
Empirical	1	Capsici Fortior	317
Rational	2	Carminativa	319
Theriacanth	87	Chloroformi Co.	334
Thermiol	627	Convallariæ	367
Thermodin	667	Coscin	370
Thermofuge	423	Daturæ Semen	381
Thigenol	631	Eucalypti	394
Thiocol	372	Gummi	394
Thioform	280	Euonymi	396
Thiol	630	Grindeliæ	429
Liquidum	630	Guaranæ	431
Siccum	630	Guaia	430
Thio-Resorcin	461, 563	Hyoscyami Radix	456
Thiuret	461	Iodi Decolorata	463
Thiosinamum	615	Jalapæ Co.	477
Thompson's Fluid	183	Kaladaniæ	479
Thus Americanum	653	Lobeliæ	489
Thymaglyceme	655	Lupulina	490
Thymic Acid	702	Menthol Ether	498
Tablets	702	Moschi	504
Thymol	654	Myrrh et Boraci	182
Acetate of Mercury	444	Olivei Cortex	518
Carbonate	654	Opri Crocata	521
Gauze	654	Phosphori Co.	548
Solution (Volekman's)	654	Physostigmatis	552
Vapour	654	Picrochuzæ	555
Thymotal	654	Podophylli Ammoniatæ	569
Thymus Extract	702	Indici	571
Thyrocoll	656	Pulsatillæ	588
Thyroglandin	656	Tinosporæ	658
Thyroideum Siccum	656	Valerianæ Indici	
Thyro-iodin	464	Ammoniatæ	674
Thyroid Gland	702	Warburg's	345
Thyroidectin	703	Zingiberis Fort.	684
Thyrolitic Serum	703		
Tincturæ, Tinctures	52, 98	Tinea, action on	122
Preparations of	98	Tinnivelly Senna	611
table of	53-6	Tinospora	658
Tinctura Adhatodæ	207	Tisi	485
Aloes Co.	224	Toddalia	659
Alstoniæ	227	Toleration	105
Ammonia Co.	232	Tolu, Balsam of	264
Andrographidis	242	Tolylantipyrine	544
Co.	242	Tolypyrin	544
Antiperiodica	345	Tolysal	15
Apocyni	249	Tonics	
Aristolochiæ	257	Cardiac	3
		Varieties of	3

	PAGE
Tongue, action on	121
Toughened Caustic	251
Toxicology	1
Tragacantha	659
Transfusion	103
Traumatol	461
Tribromophenol	185
Trichlor Butylidene Glycol	291
Ethylidene Glycol	328
Methane	334
Phenol	185
Triferrin	403
Tri-iodo Methane	459
Trinitrin	660
Trional	637
Triphenin	543
Triticum	216
Triturations, Triturations	12, 73
Trochisci, Troches	56, 99
Ammonii Chloridi	236
Boracis	182
Eucalypt. Co.	394
Ferri Carbonatis Sacch.	399
Kino	481
Opil	521
Papain	536
table of	57
Tropacocaine	355
Trypsin	535
Tuberculin T.R.	697
Tumenol	631
Turkish Bath	66
Turner's Cerate	680
Turpentine Oil	647
Turpentine, French Oil of	647
Turpethum	662
Tussol	544
Tutia	378
Tylophoræ Folia	663

U

Ulmarene	417
Unguenta	58, 99
Extensa	72
table of	58-61
Unguentum Acidi Chrysophani	252
Benzolæ c. Cocaina	267
Bismuthi	274
.	281

Unguentum Bismuthi Oxidum	
Calaminæ	65
Cocculi	55
Cupræ Oleatis	37
Diachylon	76
Gynocardia	10
Hydrarg. Mitius	
Dilutum	4
Ichthyol	
Co.	
Iodoformi c. Atropina	50
Iodoparaffini	50
Kaolini	2
Metallorum	
Mylabridis	60
Myrobalani	50
c. Opio	50
Naphtholi	51
Co.	51
Oleo-resina Capsici	51
Picis Molle	56
Pilocarpina	51
Potassæ Sulphuratæ	51
Prophylaxis	51
Salol c. Cocaina	51
Sulphuris Co.	51
c. Hydrargyro	51
Hydrochloritis	51
et Resorcini	51
Thymol	55
Zinci c. Acido-Salicyli	51
Unna's Paste	
Ural	
Uralium	
Uranii Nitras	
et Quinina Chloridum	61
Urari	
Urea	
action on	2
Quinine	2
Urethane	1
Urethra, action on	1
Urginea	1
Uricidin	1
Urinæ Apparatus, action on	1
Sedatives	1
Urine, action on	1
Uropherin	1
Urotropine	1
Quinate	1
Ursal	1

	PAGE
Uterine depressants	165
Uterus, action on	164
Uvæ Ursi Folia	671

V

Valerianæ Rhizoma	672
Indicæ Rhizoma	674
Vallet's Mass	399
Validol	498
Valsol	538
Vapores, vapours	73
Vapor Ammonii Chloridi	236
Bath	65
Benzoini	274
Coninæ	365
Creosoti	371
Eucalypti	395
Iodi	464
Olei Pini	557
Terebinæ	646
Thymol	654
Varnishes	73
Varnishing Pills	90
Vascular Stimulants	142
Vaseline	538
Vaselinum	73
Vaso-constrictors	143
Vaso-dilators	143
Vaso-motor Centre, action on	143
Vasogen	538
Vegetable Calomel	569
Vehicle in a recipe	115
Veratrina	674
Veratrinæ Oleum	675
Vermicides	130
Vermifuges	130
Veronal	666
Vesicants	143
Vesicant, Anodyne	12
Viburnum	676
Vienna Paste	301, 572
Vina	61
Vinegars	16
Vinegar of Cantharides	13
Vinum Aurantii	218
Detannatum	218
Emetinæ	470
Cocæ	353
Opii	521
Pepsinæ	541

	PAGE
Vinum, table of	61-2
Xericum	218
Detannatum	218
Virgin Scammony	500
Virginian Prune Bark	580
Virginian Snake Root	613
Virol	708
Vitellin	254
Vitriol, Blue	378
Elixir of	194
White	679
Vlemmicks' Solution	303, 642
Voelckman's Thymol Solution	654
Voice Tablets	579

W

Wafer-papers	73
Wahoo	396
Warburg's Tincture	345
Ward's Paste	20, 558
Warm bath	64
Warming plaster	22, 313
Wash, Black	443
Yellow	442
Washing Soda	621
Water	18, 77
Distilled	249
Glass	628
Preparations of	77-8
Waxes	7
Weighing	76
Weights	12
Indian Domestic	16
in Prescription	112
Wet sheet-pack	63
Wheat Phosphates, Saccharated	551
Whisky	218
White Arsenic	171
Beeswax	325
Lead	565
Mustard Seeds	614
Precipitate	443
Ointment	443
Vitriol	679
Wax	325
Whitehead's Paint	459
White Corpuscles, action on	13
Wild Cherry Bark	5
Wilkinson's Ointment	6

PAGE

	PAGE
T Wind Flower	588
T Wintergreen, oil of	416
T Witch hazel	434
T Wood Anemone	588
T Charcoal	318
T Naphtha	218
T Tar	560
Wool, Sublimate	442
Wourali, Wourara	664
T Wright's Staphylococcic Vaccine	700
X	
T Xaxaquin	345
T Xeraform	282

Yellow Eosin . . .
Wash . . .
Wound Stone . . .
Yersin's Antiplague Serum . . .

Z

Zinc . . .
Hydroxycarbonate . . .
Potassium Permanganate . . .
Preparations of . . .
Zinc Peroxidum . . .
Phosphidum . . .
Valerianas . . .
Zingiber . . .
Zymine . . .

